

Coordinate System

DPP 1.1

Distance Formula, Section Formula, Area, Different Centers of Triangle

Single Correct Answer Type

1. The maximum value of

$$y = \sqrt{(x-3)^2 + (x^2-2)^2} - \sqrt{x^2 + (x^2-1)^2} \text{ is}$$

- (a) 3 (b) $\sqrt{10}$
 (c) $2\sqrt{5}$ (d) none of these
2. Number of values of α such that the points $(\alpha, 6)$, $(-5, 0)$ and $(5, 0)$ form an isosceles triangle is
 (a) 4 (b) 5
 (c) 6 (d) 7
3. The number of triangles which are obtuse and which have the points $(8, 9)$, $(8, 16)$ and $(20, 25)$ as the feet of perpendiculars drawn from the vertices on the opposite sides is
 (a) 0 (b) 1
 (c) 2 (d) 3
4. If m_1, m_2 be the roots of the equation $x^2 + (\sqrt{3} + 2)x + \sqrt{3} - 1 = 0$, then the area of the triangle formed by the lines $y = m_1x$, $y = m_2x$ and $y = 2$ is
 (a) $\sqrt{33} - \sqrt{11}$ sq. units (b) $\sqrt{11} + \sqrt{33}$ sq. units
 (c) $2\sqrt{33}$ sq. units (d) 121 sq. units
5. A triangle AB having vertices $A(5, 1)$, $B(-1, -7)$ and $C(1, 4)$. L be the line mirror passing through C and parallel to AB and a light ray emanating from point A goes along

the direction of internal bisector of the angle A , which meets the mirror and BC at E, D respectively. The sum of the areas of $\triangle ADC$ and $\triangle BDE$ is

- (a) 17 sq. unit (b) 18 sq. units
 (c) $\frac{50}{3}$ sq. units (d) 20 sq. units
6. If G is the centroid of triangle with vertices $A(a, 0)$, $B(-a, 0)$ and $C(b, c)$, then $\frac{AB^2 + BC^2 + CA^2}{GA^2 + GB^2 + GC^2} =$
 (a) 1 (b) 2 (c) 3 (d) 4
7. If $A(5, 2)$, $B(10, 12)$ and $P(x, y)$ is such that $\frac{AP}{PB} = \frac{3}{2}$, then the internal bisector of $\angle APB$ always passes through
 (a) $(20, 32)$ (b) $(8, 8)$
 (c) $(8, -8)$ (d) $(-8, -8)$
8. Let ABC is be a fixed triangle and P be variable point in the plane of triangle ABC . Suppose a, b, c are lengths of sides BC, CA, AB opposite to angles A, B, C , respectively. If $a(PA)^2 + b(PB)^2 + c(PC)^2$ is minimum, then point P with respect to $\triangle ABC$ is
 (a) centroid (b) circumcentre
 (c) orthocenter (d) incentre
9. The incentre of a triangle with vertices $(7, 1)$, $(-1, 5)$ and $(3 + 2\sqrt{3}, 3 + 4\sqrt{3})$ is
 (a) $\left(3 + \frac{2}{\sqrt{3}}, 3 + \frac{4}{\sqrt{3}}\right)$ (b) $\left(1 + \frac{2}{3\sqrt{3}}, 1 + \frac{4}{3\sqrt{3}}\right)$
 (c) $(7, 1)$ (d) None of these

1.2 Coordinate Geometry

10. $P(\cos \alpha, \sin \alpha)$, $Q(\cos \beta, \sin \beta)$, $R(\cos \gamma, \sin \gamma)$ are vertices of triangle whose orthocenter is $(0, 0)$ then the value of $\cos(\alpha - \beta) + \cos(\beta - \gamma) + \cos(\gamma - \alpha)$ is

(a) $-3/2$ (b) $-1/2$
(c) $1/2$ (d) $3/2$

11. Three vertices of a triangle ABC are $A(2, 1)$, $B(7, 1)$ and $C(3, 4)$. Images of this triangle are taken in x -axis, y -axis and the line $y = x$. If G_1 , G_2 and G_3 are the centroids of the three image triangles then area of triangle $G_1G_2G_3$ is equal to

(a) 10 sq. units (b) 20 sq. units
(c) 25 sq. units (d) 30 sq. units

Comprehension Type

For Q. 12 and 13

$A(x_1, y_1)$, $B(x_2, y_2)$, $C(x_3, y_3)$ are three vertices of a triangle ABC . $lx + my + n = 0$ is an equation of the line L .

12. If L intersects the sides BC , CA and AB of the triangle ABC at P , Q , R , respectively, then $\frac{BP}{PC} \times \frac{CQ}{QA} \times \frac{AR}{RB}$ is equal to

(a) -1 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) 1

13. If P divides BC in the ratio $2 : 1$ and Q divides CA in the ratio $1 : 3$ then R divides AB in the ratio (P , Q , R are the points as in problem 1)

(a) $2 : 3$ internally (b) $2 : 3$ externally
(c) $3 : 2$ internally (d) $3 : 2$ externally

For Q. 14 and 15

Let $A(0, \beta)$, $B(-2, 0)$ and $C(1, 1)$ be the vertices of a triangle. Then

14. Angle A of the triangle ABC will be obtuse if β lies in

(a) $(-1, 2)$ (b) $\left(2, \frac{5}{2}\right)$
(c) $\left(-1, \frac{2}{3}\right) \cup \left(\frac{2}{3}, 2\right)$ (d) none of these

15. All the values of β for which angle A of triangle ABC is largest lie in the interval

(a) $(-2, 1)$ (b) $\left(-2, \frac{2}{3}\right) \cup \left(\frac{2}{3}, 1\right)$
(c) $\left(-2, \frac{2}{3}\right) \cup \left(\frac{2}{3}, \sqrt{6}\right)$ (d) none of these

Answers Key

Single Correct Answer Type

1. (b) 2. (b) 3. (d) 4. (b) 5. (c)
6. (c) 7. (b) 8. (d) 9. (a)
10. (a) 11. (b)

Comprehension Type

12. (a) 13. (d) 14. (c) 15. (c)

DPP 1.2

Locus, Polar Coordinates, Translation and Rotation of Axis, Slope of Line

Single Correct Answer Type

- A and B are fixed points such that $AB = 2a$. The vertex C of $\triangle ABC$ moves such that $\cot A + \cot B = \text{constant}$. The locus of C is a
 - straight line perpendicular to AB
 - straight line parallel to AB
 - circle
 - none of these
- Two vertices of a triangle are (1, 3) and (4, 7). The orthocentre lies on the line $x + y = 3$. The locus of the third vertex is
 - $x^2 - 2xy + 2y^2 - 3x - 4y + 36 = 0$
 - $2x^2 - 4xy + 3y^2 - 4x - y + 42 = 0$
 - $3x^2 + xy - 4y^2 - 2x + 24y - 40 = 0$
 - $x^2 - 4xy + 3y^2 - 2x - y + 40 = 0$
- Let P be the point (-3, 0) and Q be a moving point (0, 3t). Let PQ be trisected at R so that R is nearer to Q. RN is drawn perpendicular to PQ meeting the x-axis at N. The locus of the mid-point of RN is
 - $(x + 3)^2 - 3y = 0$
 - $(y + 3)^2 - 3x = 0$
 - $x^2 - y = 1$
 - $y^2 - x = 1$
- Given $\frac{x}{a} + \frac{y}{b} = 1$ and $ax + by = 1$ are two variable lines, 'a' and 'b' being the parameters connected by the relation $a^2 + b^2 = ab$. The locus of the point of intersection has the equation
 - $x^2 + y^2 + xy - 1 = 0$
 - $x^2 + y^2 - xy + 1 = 0$
 - $x^2 + y^2 + xy + 1 = 0$
 - $x^2 + y^2 - xy - 1 = 0$
- The extremities of a diagonal of a rectangle are (0, 0) and (4, 4). The locus of the extremities of the other diagonal is equal to
 - $x^2 + y^2 - 4x - 4y = 0$
 - $x^2 + y^2 + 4x + 4y - 4 = 0$
 - $x^2 + y^2 + 4x + 4y + 4 = 0$
 - $x^2 + y^2 - 4x - 4y - 4 = 0$
- The equation of the altitudes AD, BE, CF of a triangle ABC are $x + y = 0$, $x - 4y = 0$ and $2x - y = 0$, respectively. If $A \equiv (t, -t)$ where t varies, then the locus of the centroid of triangle ABC is
 - $y = -5x$
 - $y = x$
 - $x = -5y$
 - $x = -y$
- The real value of a for which the value of m satisfying the equation $(a^2 - 1)m^2 - (2a - 3)m + a = 0$ gives the slope of a line parallel to the y-axis is
 - $\frac{3}{2}$
 - 0
 - 1
 - ± 1
- If the lines $y = 3x + 1$ and $2y = x + 3$ are equally inclined to the line $y = mx + 4$, then $m =$
 - $\frac{1 + 3\sqrt{2}}{7}$
 - $\frac{1 - 3\sqrt{2}}{7}$
 - $\frac{1 \pm 3\sqrt{2}}{7}$
 - $\frac{1 \pm 5\sqrt{2}}{7}$
- In a triangle ABC, AB is parallel to y-axis, BC is parallel to x-axis, centroid is at (2, 1). If median through C is $x - y = 1$, then the slope of median through A is
 - 2
 - 3
 - 4
 - 5
- The number of rational points on the line joining $(\sqrt{5}, 3)$ and $(3, \sqrt{3})$ is
 - 0
 - 1
 - 2
 - infinite
- The Cartesian co-ordinates of point having polar coordinates $\left(-2, \frac{2\pi}{3}\right)$ will be
 - $(1, \sqrt{3})$
 - $(\sqrt{3}, 1)$
 - $(1, -\sqrt{3})$
 - $(-1, \sqrt{3})$
- The line passing through $(-1, \pi/2)$ and perpendicular to $\sqrt{3} \sin \theta + 2 \cos \theta = \frac{4}{r}$ is
 - $2 = \sqrt{3} r \cos \theta - 2 r \sin \theta$
 - $5 = -2\sqrt{3} r \sin \theta + 4 r \cos \theta$
 - $2 = \sqrt{3} r \cos \theta + 2 r \cos \theta$
 - $5 = 2\sqrt{3} r \sin \theta + 4 r \cos \theta$
- If origin is shifted to $(-2, 3)$ then transformed equation of curve $x^2 + 2y - 3 = 0$ w.r.t. to (0, 0) is
 - $x^2 - 4x + 2y + 4 = 0$
 - $x^2 - 4x - 2y - 5 = 0$
 - $x^2 + 4x + 2y - 5 = 0$
 - None of these

Multiple Correct Answers Type

14. Coordinates of points on curve $5x^2 - 6xy + 5y^2 - 4 = 0$ which are nearest to origin are

- (a) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (b) $\left(-\frac{1}{2}, \frac{1}{2}\right)$
 (c) $\left(-\frac{1}{2}, -\frac{1}{2}\right)$ (d) $\left(\frac{1}{2}, -\frac{1}{2}\right)$

15. Under rotation of axes through θ , $x \cos \alpha + y \sin \alpha = P$ changes to $X \cos \beta + Y \sin \beta = P$ then

- (a) $\cos \beta = \cos (\alpha - \theta)$
 (b) $\cos \alpha = \cos (\beta - \theta)$
 (c) $\sin \beta = \sin (\alpha - \theta)$
 (d) $\sin \alpha = \sin (\beta - \theta)$

Answers Key**Single Correct Answer Type**

1. (b) 2. (c) 3. (d) 4. (a) 5. (a)
 6. (c) 7. (d) 8. (d) 9. (c) 10. (a)
 11. (c) 12. (a) 13. (c)

Multiple Correct Answers Type

14. (b, d) 15. (a, c)

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Straight Lines

DPP 2.1

Equation of Line in Different Forms

Single Correct Answer Type

- In the xy -plane, how many straight lines whose x -intercept is a prime number and whose y -intercept is a positive integer pass through the point $(4, 3)$?
(a) 1 (b) 2 (c) 3 (d) 4
- The condition that the equation $ix + my + n = 0$ represents the equation of a straight line in the normal form is
(a) $l^2 + m^2 \neq 0; n > 0$ (b) $l^2 + m^2 \neq 0; n < 0$
(c) $l^2 + m^2 = 1; n < 0$ (d) $l^2 + m^2 = 1; n > 0$
- In an isosceles triangle ABC , the coordinates of the points B and C on the base BC are respectively $(1, 2)$ and $(2, 1)$. If the equation of the line AB is $y = 2x$, then the equation of the line AC is
(a) $y = \frac{1}{2}(x - 1)$ (b) $y = \frac{x}{2}$
(c) $y = x - 1$ (d) $2y = x + 3$
- If the coordinates of the points A, B, C be $(-1, 5), (0, 0)$ and $(2, 2)$, respectively, and D be the middle point of BC , then the equation of the perpendicular drawn from B to the line AD is
(a) $x + 2y = 0$ (b) $2x + y = 0$
(c) $x - 2y = 0$ (d) $2x - y = 0$
- Two lines are drawn through $(3, 4)$, each of which makes angle of 45° with the line $x - y = 2$. Then area of the triangle formed by these lines is
(a) 9 (b) $9/2$ (c) 2 (d) $2/9$
- The line $y = 2x + 4$ is shifted 2 units along $+y$ axis, keeping parallel to itself and then 1 unit along $+x$ axis direction in the same manner, then equation of the line in its new position is,
(a) $y = 2x + 6$ (b) $y = 2x + 5$
(c) $y = 2x + 4$ (d) none of these
- A ray of light passing through the point $A(2, 3)$ reflected at a point B on line $x + y = 0$ and then passes through $(5, 3)$. Then the coordinates of B are
(a) $\left(\frac{1}{3}, -\frac{1}{3}\right)$ (b) $\left(\frac{2}{5}, -\frac{2}{5}\right)$
(c) $\left(\frac{1}{13}, -\frac{1}{13}\right)$ (d) none of these
- If the transversal $y = m_r x$; $r = 1, 2, 3$ cut off equal intercepts on the transversal $x + y = 1$ then $1 + m_1, 1 + m_2, 1 + m_3$ are in
(a) A. P. (b) G. P.
(c) H. P. (d) None of these
- The straight line $y = x - 2$ rotates about a point where it cuts the x -axis and becomes perpendicular to the straight line $ax + by + c = 0$. Then its equation is
(a) $ax + by + 20 = 0$ (b) $ax - by - 2a = 0$
(c) $bx + ay - 2b = 0$ (d) $ay - bx + 2b = 0$
- The two adjacent sides of parallelogram are $y = 0$ and $y = \sqrt{3}(x - 1)$. If equation of one diagonal is $\sqrt{3}y = (x + 1)$, then equation of other diagonal is
(a) $\sqrt{3}y = (x - 1)$ (b) $y = \sqrt{3}(x + 1)$
(c) $y = -\sqrt{3}(x - 1)$ (d) $\sqrt{3}y = -(x + 1)$

2.2 Coordinate Geometry

11. $A(3, 0)$ and $B(6, 0)$ are two fixed points and $U(x_1, y_1)$ is a variable point of the plane. AU and BU meet the y -axis at C and D , respectively, and AD meets OU at V . Then for any position of U in the plane CV passes through fixed point (p, q) , whose distance from origin is (where O is origin)
- (a) 1 unit (b) 2 units
(c) 3 units (d) 4 units.
12. If h denote the A.M, k denote G.M of the intercepts made on axes by the lines passing through $(1, 1)$ then (h, k) lies on
- (a) $y^2 = 2x$ (b) $y^2 = 4x$
(c) $y = 2x$ (d) $x + y = 2xy$
13. Let $A(a, 0)$ and $B(b, 0)$ be fixed distinct points on the x -axis, none of which coincides with the origin $O(0, 0)$, and let C be a point on the y -axis. Let L be a line through the $O(0, 0)$ and perpendicular to the line AC . The locus of the point of intersection of the lines L and BC if C varies along the y -axis, is (provided $c^2 + ab \neq 0$)
- (a) $\frac{x^2}{a} + \frac{y^2}{b} = x$ (b) $\frac{x^2}{a} + \frac{y^2}{b} = y$
(c) $\frac{x^2}{b} + \frac{y^2}{a} = x$ (d) $\frac{x^2}{b} + \frac{y^2}{a} = y$
14. If AD , BE and CF are the altitudes of a triangle ABC whose vertex A is the point $(-4, 5)$. The coordinates of the points

E and F are $(4, 1)$ and $(-1, -4)$ respectively, then equation of BC is

- (a) $3x - 4y - 28 = 0$ (b) $4x + 3y - 28 = 0$
(c) $3x - 4y + 28 = 0$ (d) $x + 2y + 7 = 0$
15. Let P and Q be any two points on the lines represented by $2x - 3y = 0$ and $2x + 3y = 0$ respectively. If the area of triangle OPQ (where O is origin) is 5, then which of the following is not the possible equation of the locus of mid-point of PQ ?
- (a) $4x^2 - 9y^2 + 30 = 0$ (b) $4x^2 - 9y^2 - 30 = 0$
(c) $9x^2 - 4y^2 - 30 = 0$ (d) none of these

Comprehension Type

For Q. 16 and 17

In a $\triangle ABC$, $A = (2, 3)$ and medians through B and C have equations $x + y - 1 = 0$ and $2y - 1 = 0$

16. Equation of median through A is

- (a) $x + y = 4$ (b) $5x - 3y = 1$
(c) $5x + 3y = 1$ (d) $5x = 3y$

17. Equation of side BC is

- (a) $5x + 13y + 11 = 0$ (b) $5x - 3y = 1$
(c) $5x = 3y$ (d) $5x + 13y - 11 = 0$

Answers Key

Single Correct Answer Type

1. (b) 2. (c) 3. (b) 4. (c) 5. (b)
6. (c) 7. (c) 8. (c) 9. (d) 10. (c)
11. (b) 12. (a) 13. (c) 14. (a) 15. (c)

Comprehension Type

16. (b) 17. (a)

DPP 2.2

Parametric Form of Straight Line, Distance of Point from the Line and Position of Point w.r.t. Line

Single Correct Answer Type

- The acute angle between two straight lines passing through the point $M(-6, -8)$ and the points in which the line segment $2x + y + 10 = 0$ enclosed between the coordinate axes is divided in the ratio $1 : 2 : 2$ in the direction from the point of its intersection with the x -axis to the point of intersection with the y -axis
(a) $\pi/3$ (b) $\pi/4$ (c) $\pi/6$ (d) $\pi/12$
- A variable line L is drawn through $O(0, 0)$ to meet lines $L_1: 2x + 3y = 5$ and $L_2: 2x + 3y = 10$ at point P and Q , respectively. A point R is taken on L such that $2OP \cdot OQ = OR \cdot OP + OR \cdot OQ$. Locus of R is
(a) $9x + 6y = 20$ (b) $6x - 9y = 20$
(c) $6x + 9y = 20$ (d) none of these
- The complete set of values of the parameter α so that the point $P(\alpha, (1 + \alpha^2)^{-1})$ does not lie outside the triangle formed by the lines $L_1: 15y = x + 1$, $L_2: 78y = 118 - 23x$ and $L_3: y + 2 = 0$ is
(a) $(0, 5)$ (b) $[2, 5]$ (c) $[1, 5]$ (d) $[0, 2]$
- If A and B are two points on the line $3x + 4y + 15 = 0$ such that $OA = OB = 9$ units, then the area of the triangle OAB is
(a) 18 sq. units (b) $18\sqrt{2}$ sq. units
(c) 27 sq. units (d) none of these
- The number of points on the line $3x + 4y = 5$, which are at a distance of $\sec^2 \theta + 2 \operatorname{cosec}^2 \theta$, $\theta \in R$, from the point $(1, 3)$ is
(a) 1 (b) 2 (c) 3 (d) infinite
- ABC is an equilateral triangle whose centroid is origin and base BC is along the line $11x + 60y = 122$. Then
(a) Area of the triangle is numerically equal to the perimeter
(b) Area of triangle is numerically double the perimeter
(c) Area of triangle is numerically three times the perimeter
(d) Area of triangle is numerically half of the perimeter

- If the distance of a given point (α, β) from each of two straight lines $y = mx$ through the origin is d , then $(\alpha\gamma - \beta x)^2$ is equal to
(a) $x^2 + y^2$ (b) $d^2 (x^2 + y^2)$
(c) d^2 (d) None of these

Multiple Correct Answers Type

- The point $P(\alpha, \alpha + 1)$ will lie inside the triangle whose vertices are $A(0, 3)$, $B(-2, 0)$ and $C(6, 1)$ if
(a) $\alpha = -1$ (b) $\alpha = -\frac{1}{2}$
(c) $\alpha = \frac{1}{2}$ (d) $-\frac{6}{7} < \alpha < \frac{3}{2}$
- A straight line passing through the point $A(-2, -3)$ cuts lines $x + 3y = 9$ and $x + y + 1 = 0$ at B and C , respectively. If $AB \cdot AC = 20$, then equation of the possible line is
(a) $x - y = 1$ (b) $x - y + 1 = 0$
(c) $3x - y + 3 = 0$ (d) $3x - y = 3$
- If $A(3, 4)$ and $B(-5, -2)$ are the extremities of the base of an isosceles triangle ABC with $\tan C = 2$, then point C can be
(a) $\left(\frac{3\sqrt{5}-1}{2}, -(1+2\sqrt{5})\right)$
(b) $\left(-\frac{(3\sqrt{5}+5)}{2}, 3+2\sqrt{5}\right)$
(c) $\left(\frac{3\sqrt{5}-1}{2}, 3-2\sqrt{5}\right)$
(d) $\left(-\frac{(3\sqrt{5}-5)}{2}, -(1-2\sqrt{5})\right)$
- If (a, b) be an end of a diagonal of a square and the other diagonal has the equation $x - y = a$, then another vertex of the square can be
(a) $(a - b, a)$ (b) $(a, 0)$
(c) $(0, -a)$ (d) $(a + b, b)$

Answers Key

Single Correct Answer Type

1. (b) 2. (c) 3. (c) 4. (b) 5. (b)
6. (a) 7. (b)

Multiple Correct Answers Type

8. (b, c, d) 9. (a, c) 10. (a, b) 11. (b, d)

DPP 2.3

Concurrency of Lines, Equation of Angle Bisector, Family of Straight Lines

Single Correct Answer Type

- The values of k for which lines $kx + 2y + 2 = 0$, $2x + ky + 3 = 0$, $3x + 3y + k = 0$ are concurrent are
 (a) $\{2, 3, 5\}$ (b) $\{2, 3, -5\}$
 (c) $\{3, -5\}$ (d) $\{-5\}$
- The set of real values of k for which the lines $x + 3y + 1 = 0$, $kx + 2y - 2 = 0$ and $2x - y + 3 = 0$ form a triangle is
 (a) $R - \left\{-4, \frac{2}{3}\right\}$ (b) $R - \left\{-4, \frac{-6}{5}, \frac{2}{3}\right\}$
 (c) $R - \left\{\frac{-2}{3}, 4\right\}$ (d) R
- Locus of the points which are at equal distance from $3x + 4y - 11 = 0$ and $12x + 5y + 2 = 0$ and which is near the origin is
 (a) $21x - 77y + 153 = 0$ (b) $99x + 77y - 133 = 0$
 (c) $7x - 11y = 19$ (d) None of these
- Pair of lines through $(1, 1)$ and making equal angle with $3x - 4y = 1$ and $12x + 9y = 1$ intersect x -axis at P_1 and P_2 , then P_1, P_2 may be
 (a) $\left(\frac{8}{7}, 0\right)$ and $\left(\frac{9}{7}, 0\right)$ (b) $\left(\frac{6}{7}, 0\right)$ and $(8, 0)$
 (c) $\left(\frac{8}{7}, 0\right)$ and $\left(\frac{1}{8}, 0\right)$ (d) $(8, 0)$ and $\left(\frac{1}{8}, 0\right)$
- The algebraic sum of distances of the line $ax + by + 2 = 0$ from $(1, 2)$, $(2, 1)$ and $(3, 5)$ is zero and the lines $bx - ay + 4 = 0$ and $3x + 4y + 5 = 0$ cut the co-ordinate axes at concyclic points. Then
 (a) $a + b = -\frac{2}{7}$
 (b) area of the triangle formed by the line $ax + by + 2 = 0$ with coordinate axes is $\frac{14}{5}$.
 (c) line $ax + by + 3 = 0$ always passes through the point $(-1, 1)$
 (d) $\max\{a, b\} = \frac{5}{7}$
- The equation of line which equally inclined to the axis and passes through common points of family of lines $4acx + y(ab + bc + ca - abc) + abc = 0$ where $a, b, c > 0$ are in H.P. is
 (a) $y - x = \frac{7}{4}$ (b) $y - x = -\frac{7}{4}$
 (c) $y - x = \frac{1}{4}$ (d) $y - x = -\frac{1}{4}$
- The base BC of a triangle ABC is bisected at the point (p, q) and the equations to the sides AB and AC are $px + qy = 1$ and $qx + py = 1$. The equation of the median through A is
 (a) $qx - py = 0$
 (b) $\frac{x}{p} + \frac{y}{q} = 2$
 (c) $(2pq - 1)(px + qy - 1) = (p^2 + q^2 - 1)(qx + py - 1)$
 (d) $(p - 2q)x + (q - 2p)y = p^2 + q^2$
- $A(x_1, y_1), B(x_2, y_2), C(x_3, y_3)$ are three vertices of a triangle ABC . $lx + my + n = 0$ is an equation of the line L . If the centroid of the triangle ABC is at the origin and algebraic sum of the lengths of the perpendicular from the vertices of triangle ABC on the line L is equal to 1, then sum of the squares of reciprocals of the intercepts made by L on the coordinate axes is equal to
 (a) 0 (b) 4 (c) 9 (d) 16
- A straight line passes through the point of intersection $x - 2y - 2 = 9$ and $2x - by - 6 = 0$ and the origin. Then the complete set of values of b for which the acute angle between this line and $y = 0$ is less than 45° is
 (a) $(-\infty, 4) \cup (7, \infty)$
 (b) $(-\infty, 5) \cup (7, \infty)$
 (c) $(-\infty, 4) \cup (5, 7) \cup (7, \infty)$
 (d) $(-\infty, 4) \cup (4, 5) \cup (7, \infty)$
- The locus of the foot of the perpendicular from the origin on each member of the family $(4a + 3)x - (a + 1)y - (2a + 1) = 0$ is
 (a) $(2x - 1)^2 + 4(y + 1)^2 = 5$
 (b) $(2x - 1)^2 + (y + 1)^2 = 5$
 (c) $(2x + 1)^2 + 4(y - 1)^2 = 5$
 (d) $(2x - 1)^2 + 4(y - 1)^2 = 5$

Multiple Correct Answers Type

11. Equations of the diagonals of a rectangle are $y + 8x - 17 = 0$ and $y - 8x + 7 = 0$. If the area of the rectangle is 8 sq. units, then the equation of the sides of the rectangle is/are
 (a) $x = 1$ (b) $x + y = 1$
 (c) $y = 9$ (d) $x - 2y = 3$
12. If $6a^2 - 3b^2 - c^2 + 7ab - ac + 4bc = 0$ then the family of lines $ax + by + c, |a| + |b| \neq 0$ is concurrent at
 (a) $(-2, -3)$ (b) $(3, -1)$
 (c) $(2, 3)$ (d) $(-3, 1)$
13. If graph of $xy = 1$ is reflected in $y = 2x$ to give the graph $12x^2 + rxy + sy^2 + t = 0$, then
 (a) $r = 7$ (b) $s = -12$
 (c) $t = 25$ (d) $r + s = -19$

Comprehension Type**For Q. 14 and 15**

Let A, B, C be angles of triangle with vertex $A \equiv (4, -1)$ and internal angular bisectors of angles B and C be $x - 1 = 0$ and $x - y - 1 = 0$ respectively.

14. Slope of BC is

(a) $1/2$ (b) 2
 (c) 3 (d) 12

15. If A, B, C are angles of triangle at vertices A, B, C

respectively then $\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right) =$

(a) 2 (b) 3
 (c) 4 (d) 6

Answers Key**Single Correct Answer Type**

1. (c) 2. (b) 3. (b) 4. (b) 5. (c)
 6. (a) 7. (c) 8. (c) 9. (d) 10. (d)

Multiple Correct Answers Type

11. (a, c) 12. (a, b) 13. (b, c, d)

Comprehension Type

14. (b) 15. (d)

Pair of Straight Lines

DPP 3.1

Pair of Straight Lines

Single Correct Answer Type

- A circle rolls between pair of lines $9x^2 + 24xy + 16y^2 - 25 = 0$ touching both of them. Then its area is
 (a) 4π sq. units (b) 8π sq. units
 (c) 12π sq. units (d) π sq. units
- The value of λ with $|\lambda| < 16$ such that $2x^2 - 10xy + 12y^2 + 5x + \lambda y - 3 = 0$ represents a pair of straight lines is
 (a) -10 (b) -9
 (c) 10 (d) 9
- If the equation $2x^2 + 2hxy + 6y^2 - 4x + 5y - 6 = 0$ represents a pair of straight lines, then the length of intercept on the x -axis cut by the lines is equal to
 (a) 2 (b) 4
 (c) $\sqrt{7}$ (d) 0
- The joint equation of pair of lines which passes through origin and are perpendicular to the lines represented the equation $y^2 + 3xy - 6x + 5y - 14 = 0$ will be
 (a) $y^2 - 3xy = 0$ (b) $3y^2 - xy = 0$
 (c) $x^2 - 3xy = 0$ (d) $3x^2 - xy = 0$
- If the equation $4y^3 - 8a^2yx^2 - 3ay^2x + 8x^3 = 0$ represents three straight lines, two of them are perpendicular, then sum of all possible values of a is equal to
 (a) $\frac{3}{8}$ (b) $-\frac{3}{4}$
 (c) $\frac{1}{4}$ (d) -2
- If the lines $3x^2 - 4xy + y^2 + 8x - 2y - 3 = 0$ and $2x - 3y + \lambda = 0$ are concurrent, then the value of λ is
 (a) $4\pi - 11$ (b) -11
 (c) $\frac{1}{11}$ (d) 11
- A line passes through (2, 0). Then which of the following is not the slope of the line, for which its intercept between $y = x - 1$ and $y = -x + 1$ subtends a right angle at the origin
 (a) $-\frac{1}{\sqrt{3}}$ (b) $-\sqrt{3}$
 (c) $\frac{1}{\sqrt{3}}$ (d) None of these
- If the line passing through $P(1, 2)$ making an angle 45° with the x -axis in the positive direction meets the pair of lines $x^2 + 4xy + y^2 = 0$ at A and B then $PA \cdot PB =$
 (a) $\frac{13}{3}$ (b) $\frac{13}{6}$
 (c) $\frac{11}{6}$ (d) $\frac{11}{3}$
- Let $y = x$ line is median of the triangle OAB where O is origin. Equation $ax^2 + 2hxy + by^2 = 0$, $a, h, b \in \mathbb{N}$, represents combined equation of OA and OB. A and B lie on the ordinate $x = 3$. If slope of OA is twice the slope of OB, then greatest possible value of $a + 2h + b$ is
 (a) 0 (b) -2
 (c) -1 (d) Does not exist

3.2 Coordinate Geometry

10. The line $y = mx$ bisects the angle between the lines $ax^2 + 2hxy + by^2 = 0$ if
- $h(1 + m^2) = m(a + b)$
 - $h(1 - m^2) = m(a - b)$
 - $h(1 + m^2) = m(a - b)$
 - None of these
11. $x + y = 7$ and $ax^2 + 2hxy + ay^2 = 0$, ($a \neq 0$) are three real distinct lines forming a triangle then the triangle is
- isosceles
 - scalene
 - equilateral
 - right angled triangle

Multiple Correct Answers Type

12. If $x^2 + 2hxy + y^2 = 0$ ($h \neq 1$) represents the equations of the straight lines through the origin (having slopes m_1 and m_2) which make an angle α with the straight line $y + x = 0$ then
- $\sec 2\alpha = h$
 - $\cos \alpha = \sqrt{\frac{1+h}{2h}}$
 - $m_1 + m_2 = -2 \sec 2\alpha$
 - $\cot \alpha = \sqrt{\frac{h+1}{h-1}}$
13. Let $0 < p < q$ and $a \neq 0$ such that the equation $px^2 + 4axy + qy^2 + 4a(x + y + 1) = 0$ represents a pair of straight lines, then a can lie in the interval

- $(-\infty, \infty)$
- $(-\infty, p]$
- $[p, q]$
- $[q, \infty)$

14. $9x^2 + 2hxy + 4y^2 + 6x + 2fy - 3 = 0$ represents two parallel lines. Then
- $h = 6, f = 2$
 - $h = -6, f = 2$
 - $h = 6, f = -2$
 - $h = -6, f = -2$
15. Given pair of lines $2x^2 + 5xy + 2y^2 + 4x + 5y + a = 0$ and the line $L: bx + y + 5 = 0$. Then
- $a = 2$
 - $a = -2$
 - There exists no circle which touches the pair of lines and the line L if $b = 5$.
 - There exists no circle which touches the pair of lines and the line L if $b = -5$.
16. Equation $x^2 + k_1y^2 + 2k_2y = a^2$ represents a pair of perpendicular straight lines if
- $k_1 = 1, k_2 = a$
 - $k_1 = 1, k_2 = -a$
 - $k_1 = -1, k_2 = -a$
 - $k_1 = -1, k_2 = a$
17. The equation of the diagonal of the square formed by the pairs of lines $xy + 4x - 3y - 12 = 0$ and $xy - 3x + 4y - 12 = 0$ is
- $x - y = 0$
 - $x + y + 1 = 0$
 - $x + y = 0$
 - $x - y + 1 = 0$

Answers Key

Single Correct Answer Type

- (d)
- (b)
- (b)
- (c)
- (b)
- (d)
- (b)
- (a)
- (c)
- (b)

Multiple Correct Answers Type

- (a, b, c, d)
- (b, d)
- (a, d)
- (a, c)
- (c, d)
- (a, b)

DPP 4.1

Equation of Circle and its Properties-I

Single Correct Answer Type

1. If a circle passes through the points where the lines $3kx - 2y - 1 = 0$ and $4x - 3y + 2 = 0$ meet the coordinate axes then $k =$

(a) 1 (b) -1 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

2. All chords of the curve $x^2 + y^2 - 10x - 4y + 4 = 0$, which make a right angle at $(8, -2)$ pass through

(a) (2, 5) (b) (-2, -5)
(c) (-5, -2) (d) (5, 2)

3. Let $A(1, 2)$, $B(3, 4)$ be two points and $C(x, y)$ be a point such that area of $\triangle ABC$ is 3 sq. units and $(x - 1)(x - 3) + (y - 2)(y - 4) = 0$. Then number of positions of C , in the xy plane is

(a) 2 (b) 4
(c) 8 (d) 0

4. Equation of circle symmetric to the circle $x^2 + y^2 + 16x - 24y + 183 = 0$ about the line $4x + 7y + 13 = 0$ is

(a) $x^2 + y^2 + 32x - 4y + 235 = 0$
(b) $x^2 + y^2 + 32x + 4y - 235 = 0$
(c) $x^2 + y^2 + 32x - 4y - 235 = 0$
(d) $x^2 + y^2 + 32x + 4y + 235 = 0$

5. Equation of circle inscribed in $|x - a| + |y - b| = 1$ is

(a) $(x + a)^2 + (y + b)^2 = 2$
(b) $(x - a)^2 + (y - b)^2 = \frac{1}{2}$

(c) $(x - a)^2 + (y - b)^2 = \frac{1}{\sqrt{2}}$

(d) $(x - a)^2 + (y - b)^2 = 1$

6. A circle passing through the point $(2, 2(\sqrt{2} - 1))$ touches the pair of lines $x^2 - y^2 - 4x + 4 = 0$. The centre of the circle is

(a) $(2, 2\sqrt{2})$ and $(2, 6\sqrt{2} - 8)$
(b) $(2, 5\sqrt{2})$ and $(2, 7\sqrt{2})$
(c) $(2, 5\sqrt{2} - 1)$ and $(2, -3)$
(d) None of these

7. If a chord of a the circle $x^2 + y^2 = 32$ makes equal intercepts of length l on the co-ordinate axes, then

(a) $l < 8$ (b) $l < 16$
(c) $l > 8$ (d) $l > 16$

8. P and Q are any two points on the circle $x^2 + y^2 = 4$ such that PQ is a diameter. If α and β are the lengths of perpendicular from P and Q on $x + y = 1$ then the maximum value of $\alpha\beta$ is

(a) $\frac{1}{2}$ (b) $\frac{7}{2}$ (c) 1 (d) 2

9. Let $A(-4, 0)$ and $B(4, 0)$. Then the number of points $C = (x, y)$ on the circle $x^2 + y^2 = 16$ lying in first quadrant such that the area of the triangle whose vertices are A, B and C is a integer is

(a) 14 (b) 15
(c) 16 (d) none of these

4.2 Coordinate Geometry

10. A triangle is inscribed in a circle of radius 1. The distance between the orthocentre and the circumcentre of the triangle cannot be

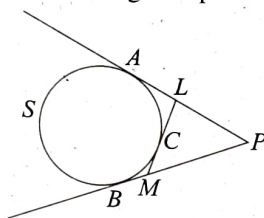
(a) 1 (b) 2 (c) $\frac{3}{2}$ (d) 4

11. The circle with equation $x^2 + y^2 = 1$ intersects the line $y = 7x + 5$ at two distinct points A and B . Let C be the point at which the positive x -axis intersects the circle. The angle ACB is

(a) $\tan^{-1}\left(\frac{4}{3}\right)$ (b) $\tan^{-1}\left(\frac{3}{4}\right)$

(c) $\pi/4$ (d) $\tan^{-1}\left(\frac{3}{2}\right)$

12. PA and PB are tangents to a circle S touching it at points A and B . C is a point on S in between A and B as shown in the figure. LCM is a tangent to S intersecting PA and PB in points L and M , respectively. Then the perimeter of the triangle PLM depends on



(a) A, B, C and P (b) P but not on C
(c) P and C only (d) the radius of S only

13. Two equal chords AB and AC of the circle $x^2 + y^2 - 6x - 8y - 24 = 0$ are drawn from the point $A(\sqrt{33} + 3, 0)$. Another chord PQ is drawn intersecting AB and AC at points R and S , respectively given that $AR = SC = 7$ and $RB = AS = 3$. The value of PR/QS is

(a) 1 (b) 1.5
(c) 2 (d) None of these

14. From a point P outside a circle with centre at C , tangents PA and PB are drawn such that $\frac{1}{(CA)^2} + \frac{1}{(PA)^2} = \frac{1}{16}$, then the length of chord AB is

(a) 6 (b) 8 (c) 4 (d) 12

15. $(1, 2\sqrt{2})$ is a point on circle $x^2 + y^2 = 9$. Which of the following is not the point on the circle at 2 unit, distance from $(1, 2\sqrt{2})$?

(a) $(-1, 2\sqrt{2})$ (b) $(2\sqrt{2}, 1)$
(c) $\left(\frac{23}{9}, \frac{10\sqrt{2}}{9}\right)$ (d) None of these

Answers Key

Single Correct Answer Type

1. (c) 2. (d) 3. (d) 4. (d) 5. (b)
6. (a) 7. (a) 8. (b) 9. (b) 10. (d)

11. (c) 12. (b) 13. (a) 14. (b) 15. (b)

DPP 4.2

Equation of Circle and its Properties-II

Single Correct Answer Type

- Inside the circles, $x^2 + y^2 = 1$, there are three smaller circles of equal radius a , tangent to each other and to S . The value of a equals
 - $\sqrt{2}(\sqrt{2} - 1)$
 - $\sqrt{3}(2 - \sqrt{3})$
 - $\sqrt{2}(2 - \sqrt{3})$
 - $\sqrt{3}(\sqrt{3} - 1)$
- If the curves $\frac{x^2}{4} + y^2 = 1$ and $\frac{x^2}{a^2} + y^2 = 1$ for suitable value of a cut on four concyclic points, the equation of circle passing through these four points is
 - $x^2 + y^2 = 2$
 - $x^2 + y^2 = 1$
 - $x^2 + y^2 = 4$
 - none of these
- AB is a chord of $x^2 + y^2 = 4$ and $P(1, 1)$ trisects AB . Then the length of the chord AB is
 - 1.5 units
 - 2 units
 - 2.5 units
 - 3 units
- AB is a chord of the circle $x^2 + y^2 = \frac{25}{2}$. P is a point such that $PA = 4$, $PB = 3$. If $AB = 5$, then distance of P from origin can be
 - $\frac{9}{\sqrt{2}}$
 - $\frac{3}{\sqrt{2}}$
 - $\frac{5}{\sqrt{2}}$
 - $\frac{7}{\sqrt{2}}$ or $\frac{1}{\sqrt{2}}$
- Chord AB of the circle $x^2 + y^2 = 100$ passes through the point $(7, 1)$ and subtends an angle of 60° at the circumference of the circle. If m_1 and m_2 are the slopes of two such chords then the value of $m_1 m_2$ is
 - 1
 - 1
 - $7/12$
 - 3
- P and Q are two points on a line passing through $(2, 4)$ and having slope m . If a line segment AB subtends a right angles at P and Q , where $A \equiv (0, 0)$ and $B \equiv (6, 0)$, then range of values of m is
 - $\left(\frac{2-3\sqrt{2}}{4}, \frac{2+3\sqrt{2}}{4}\right)$
 - $\left(-\infty, \frac{2-3\sqrt{2}}{4}\right) \cup \left(\frac{2+3\sqrt{2}}{4}, \infty\right)$
 - $(-4, 4)$
 - $(-\infty, -4) \cup (4, \infty)$
- In the xy -plane, the length of the shortest path from $(0, 0)$ to $(12, 16)$ that does not go inside the circle $(x - 6)^2 + (y - 8)^2 = 25$ is
 - $10\sqrt{3}$
 - $10\sqrt{5}$
 - $10\sqrt{3} + \frac{5\pi}{3}$
 - $10 + 5\pi$
- Triangle ABC is right angled at A . The circle with centre A and radius AB cuts BC and AC internally at D and E respectively. If $BD = 20$ and $DC = 16$ then the length AC equals
 - $6\sqrt{21}$
 - $6\sqrt{26}$
 - 30
 - 32
- All chords through an external point to the circle $x^2 + y^2 = 16$ are drawn having length l which is a positive integer. The sum of the squares of the distances from centre of circle to these chords is
 - 154
 - 124
 - 172
 - 128

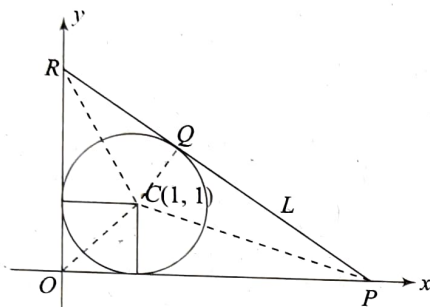
Multiple Correct Answers Type

- The line $3x + 6y = k$ intersects the curve $2x^2 + 2xy + 3y^2 = 1$ at points A and B . The circle on AB as diameter passes through the origin. The possible value/values of k is/are
 - 3
 - 4
 - 4
 - 3
- Consider the circle $x^2 + y^2 - 8x - 18y + 93 = 0$ with centre C and point $P(2, 5)$ outside it. From the point P , tangents PQ and PR are drawn to the circle with S as the midpoint of QR . The line joining P to C intersects the given circle at A and B . Which of the following hold(s) good?
 - CP is the arithmetic mean of AP and BP .
 - PR is the geometric mean of PS and PC .
 - PS is the harmonic mean of PA and PB .
 - The angle between the two tangents from P is $\tan^{-1}\left(\frac{4}{3}\right)$.
- Consider two circles $C_1 : x^2 + y^2 - 1 = 0$ and $C_2 : x^2 + y^2 - 2 = 0$. Let $A(1, 0)$ be a fixed point on the circle C_1 and B be any variable point on the circle C_2 . The line BA meets the curve C_2 again at C . Which of the following is/are correct?
 - $OA^2 + OB^2 + BC^2 \in [7, 11]$, where O is the origin.
 - $OA^2 + OB^2 + BC^2 \in [4, 7]$, where O is the origin.

- (c) Locus of midpoint of AB is a circle of radius $\frac{1}{\sqrt{2}}$.
 (d) Locus of midpoint of AB is a circle of area $\frac{\pi}{2}$.

Comprehension Type

For Q. 13 to 15



In the diagram as shown, a circle is drawn with centre $C(1, 1)$ and radius 1 and a line L . The line L is tangent to the circle at Q . Further L meets the y -axis at R and the x -axis at P in such a way that the angle OPQ equals θ where $0 < \theta < \frac{\pi}{2}$.

13. The coordinates of Q are
 (a) $(1 + \cos \theta, 1 + \sin \theta)$ (b) $(\sin \theta, \cos \theta)$
 (c) $(1 + \sin \theta, \cos \theta)$ (d) $(1 + \sin \theta, 1 + \cos \theta)$
14. Equation of the line PR is
 (a) $x \cos \theta + y \sin \theta = \sin \theta + \cos \theta + 1$
 (b) $x \sin \theta + y \cos \theta = \cos \theta + \sin \theta - 1$
 (c) $x \sin \theta + y \cos \theta = \cos \theta + \sin \theta + 1$
 (d) $x \tan \theta + y = 1 + \cot \left(\frac{\theta}{2} \right)$
15. Area of triangle OPR when $\theta = \pi/4$ is
 (a) $(3 - 2\sqrt{2})$ (b) $(3 + 2\sqrt{2})$
 (c) $(6 + 4\sqrt{2})$ (d) none of these

Answers Key**Single Correct Answer Type**

1. (b) 2. (b) 3. (d) 4. (d) 5. (a)
 6. (b) 7. (c) 8. (b) 9. (a)

Multiple Correct Answers Type

10. (a, d) 11. (a, b, c, d) 12. (a, c)

Comprehension Type

13. (d) 14. (c) 15. (b)

DPP 4.3

Tangent and Normal, Chord of Contact, Mid Point Chord

Single Correct Answer Type

- If $m(x-2) + \sqrt{1-m^2} \cdot y = 3$, is tangent to a circle for all $m \in [-1, 1]$ then the radius of the circle is
(a) 1.5 (b) 2 (c) 4.5 (d) 3
- If the line $3x - 4y - \lambda = 0$ touches the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ at (a, b) then which of the following is not the possible value of $\lambda + a + b$?
(a) 20 (b) -28 (c) -30 (d) none of these
- The normal at the point $(3, 4)$ on a circle cuts the circle at the point $(-1, -2)$. Then the equation of the circle is
(a) $x^2 + y^2 + 2x - 2y - 13 = 0$
(b) $x^2 + y^2 - 2x - 2y - 11 = 0$
(c) $x^2 + y^2 - 2x + 2y + 12 = 0$
(d) $x^2 + y^2 - 2x - 2y + 14 = 0$
- For all values of $m \in \mathbb{R}$ the line $y - mx + m - 1 = 0$ cuts the circle $x^2 + y^2 - 2x - 2y + 1 = 0$ at an angle
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$
- If the line $|y| = x - \alpha$, $\alpha > 0$ does not meet the circle $x^2 + y^2 - 10x + 21 = 0$, then $\alpha \in$
(a) $(0, 5 - 2\sqrt{2}) \cup (5 + 2\sqrt{2}, \infty)$
(b) $(5 - 2\sqrt{2}, 5 + 2\sqrt{2})$
(c) $(5 - 2\sqrt{2}, 7)$
(d) none of these
- Let C be the circle of unit radius centred at the origin. If two positive numbers x_1 and x_2 are such that the line passing through $(x_1, -1)$ and $(x_2, 1)$ is tangent to C then
(a) $x_1 x_2 = 1$ (b) $x_1 x_2 = -1$
(c) $x_1 + x_2 = 1$ (d) $4x_1 x_2 = 1$

- A circle of radius 5 is tangent to the line $4x - 3y = 18$ at $M(3, -2)$ and lies above the line. The equation of the circle is
(a) $x^2 + y^2 - 6x + 4y - 12 = 0$
(b) $x^2 + y^2 + 2x - 2y - 3 = 0$
(c) $x^2 + y^2 + 2x - 2y - 23 = 0$
(d) $x^2 + y^2 + 6x + 4y - 12 = 0$
- The line $y = mx$ intersects the circle $x^2 + y^2 - 2x - 2y = 0$ and $x^2 + y^2 + 6x - 8y = 0$ at point A and B (points being other than origin). The range of m such that origin divides AB internally is
(a) $-1 < m < \frac{3}{4}$ (b) $m > \frac{4}{3}$ or $m < -2$
(c) $-2 < m < \frac{4}{3}$ (d) $m > -1$
- If $C_1: x^2 + y^2 = (3 + 2\sqrt{2})^2$ be a circle. PA and PB are pair of tangents on C_1 where P is any point on the director circle of C_1 , then the radius of the smallest circle which touches C_1 externally and also the two tangents PA and PB is
(a) 1 (b) 2 (c) 3 (d) 4
- From points on the straight line $3x - 4y + 12 = 0$, tangents are drawn to the circle $x^2 + y^2 = 4$. Then, the chords of contact pass through a fixed point. The slope of the chord of the circle having this fixed point as its mid-point is
(a) $\frac{4}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) none of these
- If tangent at $(1, 2)$ to the circle $C_1: x^2 + y^2 = 5$ intersects the circle $C_2: x^2 + y^2 = 9$ at A and B and tangents at A and B to the second circle meet at point C , then the co-ordinates of C are given by
(a) $(4, 5)$ (b) $(\frac{9}{15}, \frac{18}{5})$
(c) $(4, -5)$ (d) $(\frac{9}{5}, \frac{18}{5})$

Answers Key

Single Correct Answer Type

1. (d) 2. (c) 3. (b) 4. (c) 5. (c)

6. (a) 7. (c) 8. (a) 9. (a) 10. (d)
11. (d)

DPP 4.4

Two Circles and Related Lines, Family of Circles

Single Correct Answer Type

- AB is a line segment of length 48 cm and C is its mid-point. If three semicircles are drawn at AB , AC and CB using as diameters, then radius of the circle inscribed in the space enclosed by three semicircles is
(a) $3\sqrt{2}$ (b) 6 (c) 8 (d) 10
- Consider circles
 $C_1: x^2 + y^2 + 2x - 2y + p = 0$
 $C_2: x^2 + y^2 - 2x + 2y - p = 0$
 $C_3: x^2 + y^2 = p^2$
 Statement – I: If the circle C_3 intersects C_1 orthogonally then C_2 does not represent a circle
 Statement – II: If the circle C_3 intersects C_2 orthogonally then C_2 and C_3 have equal radii
 Then which of the following is true ?
 (a) statement II is false and statement I is true
 (b) statement I is false and statement II is true
 (c) both the statements are false
 (d) both the statements are true
- Tangents drawn from point of intersection A of circles $x^2 + y^2 = 4$ and $(x - \sqrt{3})^2 + (y - 3)^2 = 4$ cut the line joining their centres at B and C then triangle BAC is
 (a) equilateral triangle
 (b) right angle triangle
 (c) obtuse angle triangle
 (d) isosceles triangle and $\angle ABC = \frac{\pi}{6}$
- Suppose that two circles C_1 and C_2 in a plane have no points in common. Then
 (a) there is no line tangent to both C_1 and C_2 .
 (b) there are exactly four lines tangent to both C_1 and C_2 .
 (c) there are no lines tangent to both C_1 and C_2 or there are exactly two lines tangent to both C_1 and C_2 .
 (d) there are no lines tangent to both C_1 and C_2 or there are exactly four lines tangent to both C_1 and C_2 .
- A circle of radius 2 has its centre at $(2, 0)$ and another circle of radius 1 has its centre at $(5, 0)$. A line is tangent to the two circles at point in the first quadrant. The y -intercept of the tangent line is
 (a) $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $3\sqrt{2}$ (d) $4\sqrt{2}$
- Let circle $C_1: x^2 + (y - 4)^2 = 12$ intersects circle $C_2: (x - 3)^2 + y^2 = 13$ at A and B . A quadrilateral $ACBD$ is formed by tangents at A and B to both circles. The diameter of circumcircle of quadrilateral $ACBD$ is
 (a) 4 (b) 5 (c) 6 (d) 9.25
- Transverse common tangents are drawn from O to circles C_1 and C_2 with radii 4 and 2, respectively. Then the ratio of areas of triangles formed by O and chords of contacts of respective circles is
 (a) 3 units (b) 6 units
 (c) 4 units (d) 5 units
- Equation of the straight line meeting the circle with centre at origin and radius equal to 5 in two points at equal distances of 3 units from the point $A(3, 4)$ is
 (a) $6x + 8y = 41$ (b) $6x - 8y + 41 = 0$
 (c) $8x + 6y + 41 = 0$ (d) $8x - 6y + 41 = 0$
- Two circles touch the x -axis and the line $y = mx$. They meet at $(9, 6)$ and at one more point. If the product of their radii is $\frac{117}{2}$, then the value of m is
 (a) $2\sqrt{2}$ (b) $\sqrt{2}$
 (c) $\frac{1}{\sqrt{2}}$ (d) none of these
- Tangents drawn from $P(1, 8)$ to the circle $x^2 + y^2 - 6x - 4y - 11 = 0$ touches the circle at the points A and B , respectively. The radius of the circle which passes through the points of intersection of circles $x^2 + y^2 - 2x - 6y + 6 = 0$ and $x^2 + y^2 + 2x - 6y + 6 = 0$ and intersects the circumcircle of the ΔPAB orthogonally is equal to
 (a) $\frac{\sqrt{73}}{4}$ (b) $\frac{\sqrt{71}}{2}$
 (c) 3 (d) 2
- If the radius of the circle touching the pair of lines $7x^2 - 18xy + 7y^2 = 0$ and the circle $x^2 + y^2 - 8x - 8y = 0$, and contained in the given circle is equal to k , then k^2 is equal to
 (a) 10 (b) 9 (c) 8 (d) 7
- Equation of a circle having radius equal to twice the radius of the circle $x^2 + y^2 + (2p + 3)x + (3 - 2p)y + p - 3 = 0$ and touching it at the origin is
 (a) $x^2 + y^2 + 9x - 3y = 0$
 (b) $x^2 + y^2 - 9x + 3y = 0$
 (c) $x^2 + y^2 + 18x + 6y = 0$
 (d) $x^2 + y^2 + 18x - 6y = 0$

Multiple Correct Answers Type

13. The real numbers a and b are distinct. Consider the circles

$$\omega_1: (x-a)^2 + (y-b)^2 = a^2 + b^2 \text{ and}$$

$$\omega_2: (x-b)^2 + (y-a)^2 = a^2 + b^2$$

Which of the following is (are) true?

- (a) The line $y = x$ is an axis of symmetry for the circles.
 - (b) The circles intersect at the origin and a point, P (say), which lies on the line $y = x$.
 - (c) The line $y = x$ is the radical axis of the pair of circles.
 - (d) The circles are orthogonal for all $a \neq b$.
14. Consider two circles $S_1 \equiv x^2 + y^2 + 8x = 0$ and $S_2 \equiv x^2 + y^2 - 2x = 0$. Let ΔPQR be formed by the common tangents to circles S_1 and S_2 . Then which of the following hold(s) good?
- (a) Incentre of ΔPQR is $(1, 0)$.
 - (b) The equation of radical axis of circles S_1 and S_2 is $y = 0$.
 - (c) Product of slope of direct common tangents is $\frac{16}{9}$.
 - (d) If transverse common tangent intersects direct common tangents at points A and B , then AB equals 4.
15. A circle touches the line $x + y - 2 = 0$ at $(1, 1)$ and cuts the circle $x^2 + y^2 + 4x + 5y - 6 = 0$ at P and Q . Then
- (a) PQ can never be parallel to the given line $x + y - 2 = 0$.
 - (b) PQ can never be perpendicular to the given line $x + y - 2 = 0$.
 - (c) PQ always passes through $(6, -4)$.
 - (d) PQ always passes through $(-6, 4)$.
16. A circle $S \equiv 0$ passes through the common points of family of circles $x^2 + y^2 + \lambda x - 4y + 3 = 0$ and $(\lambda \in R)$ has minimum area then
- (a) area of $S = 0$ is π sq. units
 - (b) radius of director circle of $S = 0$ is $\sqrt{2}$
 - (c) radius of director circle of $S = 0$ is 1 unit
 - (d) $S = 0$ never cuts $|2x| = 1$

Comprehension Type**For Q. 16 to 18**

Let $P(\alpha, \beta)$ be a point in the first quadrant. Circles are drawn through P touching the coordinate axes.

17. Radius of one of the circles is

- (a) $(\sqrt{\alpha} - \sqrt{\beta})^2$
- (b) $(\sqrt{\alpha} + \sqrt{\beta})^2$
- (c) $\alpha + \beta - \sqrt{\alpha\beta}$
- (d) $\alpha + \beta - \sqrt{2\alpha\beta}$

18. Relation between α and β for which two circles are orthogonal is

- (a) $\alpha^2 + \beta^2 = 4\alpha\beta$
- (b) $(\alpha + \beta)^2 = 4\alpha\beta$
- (c) $\alpha^2 + \beta^2 = \alpha\beta$
- (d) $\alpha^2 + \beta^2 = 2\alpha\beta$

19. Equation of common chord of two circles is

- (a) $x + y = \alpha - \beta$
- (b) $x + y = 2\sqrt{\alpha\beta}$
- (c) $x + y = \alpha + \beta$
- (d) $\alpha^2 - \beta^2 = 4\alpha\beta$

For Q. 20 and 21

$P(a, 5a)$ and $Q(4a, a)$ are two points. Two circles are drawn through these points touching the axis of y .

20. Centre of these circles are at

- (a) $(a, a), (2a, 3a)$
- (b) $\left(\frac{205a}{18}, \frac{29a}{3}\right), \left(\frac{5a}{2}, 3a\right)$
- (c) $\left(3a, \frac{29a}{3}\right), \left(\frac{205a}{9}, \frac{29a}{18}\right)$
- (d) none of these

21. Angle of intersection of these circles is

- (a) $\tan^{-1}(4/3)$
- (b) $\tan^{-1}(40/9)$
- (c) $\tan^{-1}(84/187)$
- (d) $\pi/4$

Answers Key**Single Correct Answer Type**

- 1. (c) 2. (b) 3. (a) 4. (d) 5. (b)
- 6. (b) 7. (c) 8. (a) 9. (a) 10. (a)
- 11. (c) 12. (d)

Multiple Correct Answers Type

13. (a, b, c) 14. (a, d) 15. (a, b, c) 16. (a, b, d)

Comprehension Type

17. (d) 18. (a) 19. (c) 20. (b) 21. (b)

DPP 4.5

Locus

Single Correct Answer Type

- Tangents PT_1 and PT_2 are drawn from a point P to the circle $x^2 + y^2 = a^2$. If the point P lies on the line $px + qy + r = 0$, then the locus of the centre of circumcircle of the triangle PT_1T_2 is
 - $px + qy = r$
 - $(x - p)^2 + (y - q)^2 = r^2$
 - $px + qy = \frac{r}{2}$
 - $2px + 2qy + r = 0$
- An isosceles triangle with base 24 and legs 15 each is inscribed in a circle with centre at $(-1, 1)$. The locus of the centroid of that Δ is
 - $4(x^2 + y^2) + 8x - 8y - 73 = 0$
 - $2(x^2 + y^2) + 4x - 4y - 31 = 0$
 - $2(x^2 + y^2) + 4x - 4y - 21 = 0$
 - $4(x^2 + y^2) + 8x - 8y - 161 = 0$
- $x^2 + y^2 = 16$ and $x^2 + y^2 = 36$ are two circles. If P and Q move respectively on these circles such that $PQ = 4$ then the locus of mid-point of PQ is a circle of radius
 - $\sqrt{20}$
 - $\sqrt{22}$
 - $\sqrt{30}$
 - $\sqrt{32}$
- A variable line moves in such a way that the product of the perpendiculars from $(4, 0)$ and $(0, 0)$ is equal to 9. The locus of the feet of the perpendicular from $(0, 0)$ upon the variable line is a circle, the square of whose radius is
 - 13
 - 15
 - 19
 - 23
- The locus of the mid-points of the chords of the circle of radius r which subtend an angle $\frac{\pi}{4}$ at any point on the circumference of the circle is a concentric circle with radius equal to
 - $\frac{r}{2}$
 - $\frac{2r}{3}$
 - $\frac{r}{\sqrt{2}}$
 - $\frac{r}{\sqrt{3}}$
- Tangents PA and PB are drawn to the circle $x^2 + y^2 = 8$ from any arbitrary point P on the line $x + y = 4$. The locus of mid-point of chord of contact AB is
 - $x^2 + y^2 - 2x - 2y = 0$
 - $x^2 + y^2 + 2x + 2y = 0$
 - $x^2 + y^2 - 2x + 2y = 0$
 - $x^2 + y^2 + 2x - 2y = 0$
- The locus of the centre of a circle which cuts a given circle orthogonally and also touches a given straight line is a
 - circle
 - line
 - parabola
 - ellipse
- A circle with radius a and centre on y -axis slides along y -axis. If a variable line through $(a, 0)$ cuts the circle at points P and Q , then the point of intersection of tangents to the circle at P and Q will lie in the region defined by
 - $y^2 \geq 4a(x - a)$
 - $y^2 \leq 4ax$
 - $x^2 + y^2 \leq 4a^2$
 - $x^2 - y^2 \geq a^2$
- The points at which two given unequal circles subtend equal angles lies on
 - a straight line
 - a circle
 - a parabola
 - none of these
- The locus of the centre of the circle which bisects the circumferences of the circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 2x + 6y + 1 = 0$ is
 - $2x - 6y - 15 = 0$
 - $2x + 6y + 15 = 0$
 - $2x - 6y + 15 = 0$
 - $2x + 6y - 15 = 0$
- Locus of centre of family of circles cutting the family of circles $x^2 + y^2 + 4x \left(\lambda - \frac{3}{2} \right) + 3y \left(\lambda - \frac{4}{3} \right) - 6(\lambda + 2) = 0$
 - $x - y - 1 = 0$
 - $4x + 3y - 6 = 0$
 - $4x + 3y + 7 = 0$
 - $3x - 4y - 1 = 0$

Multiple Correct Answers Type

- Q is any point on the circle $x^2 + y^2 = 9$. QN is perpendicular from Q to the x -axis. Locus of the point of trisection of QN is
 - $4x^2 + 9y^2 = 36$
 - $9x^2 + 4y^2 = 36$
 - $9x^2 + y^2 = 9$
 - $x^2 + 9y^2 = 9$
- Locus of the intersection of the two straight lines passing through $(1, 0)$ and $(-1, 0)$, respectively and including an angle of 45° can be a circle with
 - centre $(1, 0)$ and radius $\sqrt{2}$.
 - centre $(1, 0)$ and radius 2.
 - centre $(0, 1)$ and radius $\sqrt{2}$.
 - centre $(0, -1)$ and radius $\sqrt{2}$.

Answers Key

Single Correct Answer Type

1. (d) 2. (d) 3. (b) 4. (a) 5. (c)
6. (a) 7. (c) 8. (a) 9. (b) 10. (a)
11. (b)

Multiple Correct Answers Type

12. (a, d) 13. (c, d)

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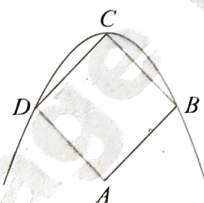
Parabola

DPP 5.1

Equation of Parabola and its Properties

Single Correct Answer Type

- The equation $x^2 - 2xy + y^2 + 3x + 2 = 0$ represents
 - A parabola
 - An ellipse
 - A hyperbola
 - A circle
- The length of the latus rectum of $3x^2 - 4y + 6x - 3 = 0$ is
 - 3
 - 2
 - $\frac{4}{3}$
 - $\frac{3}{4}$
- In the adjacent figure a parabola is drawn to pass through the vertices B , C and D of the square $ABCD$. If $A(2, 1)$, $C(2, 3)$, then focus of this parabola is



- $\left(1, \frac{11}{4}\right)$
 - $\left(2, \frac{11}{4}\right)$
 - $\left(3, \frac{13}{4}\right)$
 - $\left(2, \frac{13}{4}\right)$
- Length of the latus rectum of the parabola $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is
 - $a\sqrt{2}$
 - $\frac{a}{\sqrt{2}}$
 - a
 - $2a$

- Consider the parabola $x^2 + 4y = 0$. Let $P(a, b)$ be any fixed point inside the parabola and let S be the focus of the parabola. Then the minimum value at $SQ + PQ$ as point Q moves on the parabola is
 - $|1 - a|$
 - $|ab| + 1$
 - $\sqrt{a^2 + b^2}$
 - $1 - b$
- If the points $(2, 3)$ and $(3, 2)$ on a parabola are equidistant from the focus, then the slope of its tangent at vertex is
 - 1
 - 1
 - 0
 - ∞
- Let $A(x_1, y_1)$ and $B(x_2, y_2)$ be two points on the parabola $y^2 = 4ax$. If the circle with chord AB as a diameter touches the parabola, then $|y_1 - y_2|$ is equal to
 - $4a$
 - $8a$
 - $6\sqrt{2}a$
 - not a constant
- $y = \sqrt{3}x + \lambda$ is drawn through focus S of the parabola $y^2 = 8x + 16$. If two intersection points of the given line and the parabola are A and B such that perpendicular bisector of AB intersects the x -axis at P then length of PS is
 - $8/7$
 - $7/17$
 - $8\sqrt{3}$
 - $16/3$
- If the point $(2a, a)$ lies inside the parabola $x^2 - 2x - 4y + 3 = 0$, then a lies in the interval
 - $\left[\frac{1}{2}, \frac{3}{2}\right]$
 - $\left(\frac{1}{2}, \frac{3}{2}\right)$
 - $(1, 3)$
 - $\left(\frac{-3}{2}, \frac{-1}{2}\right)$

Multiple Correct Answers Type

10. A family of curve S is given by $S \equiv x^2 + 2xy + y^2 - 4x(1 - \lambda) - 4y(1 + \lambda) + 4$, then $S = 0$ represents
- pair of straight line $\forall \lambda \in R$
 - straight line for exactly one value of λ
 - parabola $\forall \lambda \in R - \{0\}$
 - ellipse for three values of λ
11. The curves $x^2 + y^2 + 6x - 24y + 72 = 0$ and $x^2 - y^2 + 6x + 16y - 46 = 0$ intersect in four points P, Q, R and S lying on a parabola. Let A be the focus of the parabola, then
- $AP + AQ + AR + AS = 20$
 - $AP + AQ + AR + AS = 40$
 - vertex of the parabola is at $(-3, 1)$
 - coordinates of A are $(-3, 1)$

Comprehension Type**For Q. 12 and 13**

A parabola is drawn through two given points $A(1, 0)$ and $B(-1, 0)$ such that its directrix always touches the circle $x^2 + y^2 = 4$. Then

12. The locus of focus of the parabola is

- $\frac{x^2}{4} + \frac{y^2}{3} = 1$
- $\frac{x^2}{4} + \frac{y^2}{5} = 1$
- $\frac{x^2}{3} + \frac{y^2}{4} = 1$
- $\frac{x^2}{5} + \frac{y^2}{4} = 1$

13. The maximum possible length of semilatus rectum is

- $2 + \sqrt{3}$
- $3 + \sqrt{3}$
- $4 + \sqrt{3}$
- $1 + \sqrt{3}$

Answers Key**Single Correct Answer Type**

- (a)
- (c)
- (b)
- (a)
- (d)
- (b)
- (b)
- (d)
- (b)

Multiple Correct Answers Type

10. (b, c) 11. (b, c)

Comprehension Type

12. (a) 13. (a)

DPP 5.2

Parametric Form of Parabola, Properties of Focal Chord

Single Correct Answer Type

- If AFB is a focal chord of the parabola $y^2 = 4ax$ such that $AF = 4$ and $FB = 5$ then the latus-rectum of the parabola is equal to
(a) 80 (b) $\frac{9}{80}$ (c) 9 (d) $\frac{80}{9}$
- Length of the focal chord of the parabola $(y + 3)^2 = -8(x - 1)$ which lies at a distance 2 units from the vertex of the parabola is
(a) 8 (b) $6\sqrt{2}$ (c) 9 (d) $5\sqrt{3}$
- Let $A(0, 2)$, B and C be points on parabola $y^2 = x + 4$ such that $\angle CBA = \frac{\pi}{2}$. Then the range of ordinate of C is
(a) $(-\infty, 0) \cup (4, \infty)$ (b) $(-\infty, 0] \cup [4, \infty)$
(c) $[0, 4]$ (d) $(-\infty, 0) \cup [4, \infty)$
- $lx + my = 1$ is the equation of the chord PQ of $y^2 = 4x$ whose focus is S . If PS and QS meet the parabola again at R and T respectively, then slope of RT is
(a) $-\frac{1}{m}$ (b) $\frac{l}{m}$ (c) $\frac{2}{m}$ (d) none of these
- A line from $(-1, 0)$ intersects the parabola $x^2 = 4y$ at A and B . Then the locus of centroid of $\triangle OAB$ is (where O is origin)
(a) $3x^2 - 2x = 4y$ (b) $3y^2 - 2y = 4x$
(c) $3x^2 + 2x = 4y$ (d) none of these
- All the three vertices of an equilateral triangle lie on the parabola $y = x^2$, and one of its sides has a slope of 2. Then the sum of the x -coordinates of the three vertices is
(a) $\frac{5}{9}$ (b) $\frac{9}{13}$ (c) $\frac{6}{11}$ (d) None of these
- Slope of the chord of the tangent to parabola $y^2 = 4ax$ which passes through the point $(-6a, 0)$ and which subtends an angle of 45° at the vertex is

- (a) $\pm \frac{2}{7}$ (b) $\pm \frac{3}{8}$ (c) $\pm \frac{7}{2}$ (d) $\pm \frac{5}{6}$

- Two equal circles of largest radii have following property:
(i) They intersect each other orthogonally;
(ii) They touch both the curves $4(y + 2) = x^2$ and $4(2 - y) = x^2$ in the region $x \in [-2\sqrt{2}, 2\sqrt{2}]$.

Then radius of this circle is

- (a) $\sqrt{2}$ (b) $\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{3}{2}$

- A and B are two points on the parabola $y^2 = 4ax$ with vertex O . If OA is perpendicular to OB and they have lengths r_1 and r_2 , respectively, then the value of $\frac{r_1^{4/3} r_2^{4/3}}{r_1^{2/3} + r_2^{2/3}}$ is

- (a) $16a^2$ (b) a^2 (c) $4a$ (d) None of these

- A line $ax + by + c = 0$ through the point $A(-2, 0)$ intersects the curve $y^2 = 4x$ in P and Q such that $\frac{1}{AP} + \frac{1}{AQ} = \frac{1}{4}$

(P, Q are in 1st quadrant). The value of $\sqrt{a^2 + b^2 + c^2}$ is
(a) 2 (b) 4 (c) 6 (d) 8

- Suppose a parabola $y = x^2 - ax - 1$ intersects the coordinate axes at three points A, B and C , respectively. The circumcircle of $\triangle ABC$ intersects the y -axis again at the point $D(0, t)$. Then the value of t is

- (a) $1/2$ (b) 1 (c) $3/2$ (d) 2

- The line $x - b + \lambda y = 0$ cuts the parabola $y^2 = 4ax$ ($a > 0$) at $P(t_1)$ and $Q(t_2)$. If $b \in [2a, 4a]$ then range of $t_1 t_2$ where $\lambda \in R$ is

- (a) $[-4, -2]$ (b) $[2, 4]$
(c) $[4, 16]$ (d) $[-16, -4]$

Answers Key

Single Correct Answer Type

1. (d) 2. (a) 3. (b) 4. (a) 5. (c) 6. (c) 7. (a) 8. (a) 9. (a) 10. (b)
11. (b) 12. (a)

DPP 5.3

Tangent and Normal, Chord of Contact, Mid Point Chord

Single Correct Answer Type

- If the parabola $y = (a - b)x^2 + (b - c)x + (c - a)$ touches the x -axis then the line $ax + by + c = 0$
 - always passes through a fixed point
 - represents the family of parallel lines
 - is always perpendicular to x -axis
 - always has negative slope
- A normal to parabola, whose inclination is 30° , cuts it again at an angle of
 - $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$
 - $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$
 - $\tan^{-1}(2\sqrt{3})$
 - $\tan^{-1}\left(\frac{1}{2\sqrt{3}}\right)$
- If $(-2, 5)$ and $(3, 7)$ are the points of intersection of the tangent and normal at a point on a parabola with the axis of the parabola, then the focal distance of that point is
 - $\frac{\sqrt{29}}{2}$
 - $\frac{5}{2}$
 - $\sqrt{29}$
 - $\frac{2}{5}$
- The angle of intersection between the curves $x^2 = 4(y + 1)$ and $x^2 = -4(y + 1)$ is
 - $\frac{\pi}{6}$
 - $\frac{\pi}{4}$
 - 0
 - $\frac{\pi}{2}$
- The parabolas $y^2 = 4ax$ and $x^2 = 4by$ intersect orthogonally at point $P(x_1, y_1)$ where $x_1, y_1 \neq 0$. Then
 - $b = a^2$
 - $b = a^3$
 - $b^3 = a^2$
 - None of these
- Sum of slopes of common tangent to $y = \frac{x^2}{4} - 3x + 10$ and $y = 2 - \frac{x^2}{4}$ is
 - 6
 - 3
 - 1/2
 - none of these
- The slope of normal to the parabola $y = \frac{x^2}{4} - 2$ drawn through the point $(10, -1)$ is
 - 2
 - $-\sqrt{3}$
 - 1/2
 - 5/3
- The tangent and normal at the point $P(4, 4)$ to the parabola, $y^2 = 4x$ intersect the x -axis at the points Q and R , respectively. Then the circumcentre of the ΔPQR is
 - $(2, 0)$
 - $(2, 1)$
 - $(1, 0)$
 - $(1, 2)$
- The point on the parabola $y^2 = 8x$ at which the normal is inclined at 60° to the x -axis has the co-ordinates as
 - $(6, -4\sqrt{3})$
 - $(6, 4\sqrt{3})$
 - $(-6, -4\sqrt{3})$
 - $(-6, 4\sqrt{3})$
- Two distinct chords of the parabola $y^2 = 4ax$ passing through $(a, 2a)$ are bisected by the line $x + y = 1$. The length of the latus rectum of the parabola can be
 - 9
 - 3
 - 4
 - 5
- From an external point P , pair of tangent lines are drawn to the parabola, $y^2 = 4x$. If θ_1 and θ_2 are the inclinations of these tangents with the axis of x such that, $\theta_1 + \theta_2 = \frac{\pi}{4}$, then the locus of P is
 - $x - y + 1 = 0$
 - $x + y - 1 = 0$
 - $x - y - 1 = 0$
 - $x + y + 1 = 0$
- A variable parabola $y^2 = 4ax$, $a \left(\text{where } a \neq -\frac{1}{4} \right)$ being the parameter, meets the curve $y^2 + x - 2 = 0$ at two points. The locus of the point of intersection of tangents at these points is
 - $x - 2y - 4 = 0$
 - $x - 4y + 2 = 0$
 - $x - 4y - 1 = 0$
 - $2x - y + 1 = 0$
- Let S be the focus of the parabola $y^2 = 4ax$, X be the foot of the directrix, PP' be a double ordinate of the curve and PX meet the curve again in Q . Then the locus of point of intersection of tangents at P' and Q is a
 - line
 - circle
 - parabola
 - none of these
- If BC is a latus rectum of parabola $y^2 = 4ax$ and A is the vertex, then the minimum length of the projection of BC on a tangent drawn in the portion BAC is
 - $\sqrt{2}a$
 - $2a\sqrt{2}$
 - $2a$
 - $3a\sqrt{2}$
- Through the vertex O of the parabola $y^2 = 4ax$, a perpendicular is drawn to any tangent meeting it at P and the parabola at Q . Then OP , $2a$ and OQ are in

- (a) A.P. (b) G.P.
(c) H.P. (d) none of these
16. Tangents PQ and PR are drawn to the parabola $y^2 = 20(x + 5)$ and $y^2 = 60(x + 15)$, respectively such that $\angle RPQ = \frac{\pi}{2}$. Then the locus of point P is
(a) $x + 10 = 0$ (b) $x + 30 = 0$
(c) $x + 40 = 0$ (d) $x + 20 = 0$
17. The locus of centroid of triangle formed by a tangent to the parabola $y^2 = 36x$ with coordinate axes is
(a) $y^2 = -9x$ (b) $y^2 + 3x = 0$
(c) $y^2 = 3x$ (d) $y^2 = 9x$
18. PC is the normal at P to the parabola $y^2 = 4ax$, C being on the axis. CP is produced outwards to Q so that $PQ = CP$. The locus of Q is a parabola which has focus
(a) $(a, 0)$ (b) $(-a, 0)$
(c) $(-2a, 0)$ (d) $(2a, 0)$
- (a) $(0, 1)$ (b) $(2, \infty)$
(c) $(3, \infty)$ (d) $(0, \infty)$
20. At a point P on the parabola $y^2 = 4ax$, tangent and normal are drawn. Tangent intersects the x -axis at Q and normal intersects the curve at R such that chord PR subtends an angle of 90° at its vertex. Then
(a) $PQ = 2a\sqrt{6}$
(b) $PR = 6a\sqrt{3}$
(c) area of $\Delta PQR = 18\sqrt{2}a^2$
(d) $PQ = 3a\sqrt{2}$
21. Let $y^2 - 5y + 3x + k = 0$ be a parabola, then
(a) its latus rectum is least when $k = 1$
(b) its latus rectum is independent of k
(c) the line $y = 2x + 1$ will touch the parabola if $k = \frac{73}{16}$
(d) $y = \frac{5}{2}$ is the only normal to the parabola whose slope is zero.

Multiple Correct Answers Type

19. If the parabolas $y^2 = 4kx$ ($k > 0$) and $y^2 = 4(x - 1)$ do not have a common normal other than the axis of parabola, then $k \in$

Answers Key

Single Correct Answer Type

1. (a) 2. (d) 3. (a) 4. (c) 5. (d)
6. (b) 7. (c) 8. (c) 9. (a) 10. (b)
11. (c) 12. (b) 13. (a) 14. (b) 15. (b)
16. (d) 17. (b) 18. (d)

Multiple Correct Answers Type

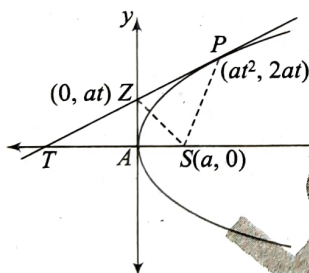
19. (a, b, c) 20. (a, b, c)
21. (b, c, d)

DPP 5.4

Properties of Tangent and Normal

Single Correct Answer Type

- If three parabolas touch all the lines $x = 0$, $y = 0$ and $x + y = 2$, the maximum area of the triangle formed by joining their foci is
 - $\sqrt{3}$
 - $\sqrt{6}$
 - $\frac{3\sqrt{3}}{4}$
 - $\frac{3\sqrt{3}}{2}$
- If $2x + 3y = \alpha$, $x - y = \beta$ and $kx + 15y = r$ are 3 concurrent normal of parabola $y^2 = \lambda x$ then value of k is
 - 3
 - 4
 - 5
 - 7
- Let $(2, 3)$ be the focus of a parabola and $x + y = 0$ and $x - y = 0$ be its two tangents. Then equation of its directrix will be
 - $2x - 3y = 0$
 - $3x + 4y = 0$
 - $x + y = 5$
 - $12x - 5y + 1 = 0$
- In the following figure, $AS = 4$ and $SP = 9$. The value of SZ is



- 6
 - 5.5
 - 6.5
 - none of these
- Let TP and TQ be any two tangents to a parabola and the tangent at a third point R cuts them in P' and Q' . Then the value of $\frac{TP'}{TP} + \frac{TQ'}{TQ}$ must be
 - 1
 - 2
 - 3
 - none of these
 - The distance of two points P and Q on the parabola $y^2 = 4ax$ from the focus S are 3 and 12 respectively. The distance of the point of intersection of the tangents at P and Q from the focus S is
 - 8
 - 6
 - 9
 - 12
 - A parabola having directrix $x + y + 2 = 0$ touches a line $2x + y - 5 = 0$ at $(2, 1)$. Then the semi-latus rectum of the parabola, is

- 8
- $\frac{9}{\sqrt{2}}$
- $\frac{10}{\sqrt{2}}$
- $\frac{11}{\sqrt{2}}$

Multiple Correct Answers Type

- Let A, B and C be three distinct points on $y^2 = 8x$ such that normals at these points are concurrent at P . The slope of AB is 2 and abscissa of centroid of $\triangle ABC$ is $\frac{4}{3}$. Which of the following is (are) correct?
 - Area of $\triangle ABC$ is 8 sq. units.
 - Coordinates of $P \equiv (6, 0)$.
 - Angle between normals are $45^\circ, 45^\circ, 90^\circ$.
 - Angle between normals are $30^\circ, 30^\circ, 60^\circ$.
- If PQ and RS are normal chords of the parabola $y^2 = 8x$ and the points P, Q, R, S are concyclic, then
 - tangents at P and R meet on X -axis
 - tangents at P and R meet on Y -axis
 - PR is parallel to Y -axis
 - PR is parallel to X -axis
- Tangents are drawn from $P(-2, 0)$ to $y^2 = 8x$. Radius of circle(s) that would touch these tangents and the corresponding chord of contact can be equal to
 - $4(\sqrt{2} + 1)$
 - $4(\sqrt{2} - 1)$
 - $8\sqrt{2}$
 - none of these
- Given a parabola $y^2 = 4ax$ and the points $A(at^2, 2at)$, $B(ar^{-2}, 2ar^{-1})$, $C\left(\frac{4a}{t^2}, \frac{4a}{t}\right)$, $D\left(a\left(t + \frac{2}{t}\right)^2, -2a\left(t + \frac{2}{t}\right)\right)$, choose all the correct alternative.
 - AB is a focal chord.
 - AD is a normal chord.
 - Normals at A, C intersect on the parabola.
 - Tangents at A, B intersect at 90° on the directrix.
- If a parabola touches the lines $y = x$ and $y = -x$ at $P(3, 3)$ and $Q(2, -2)$, respectively, then
 - focus is $\left(\frac{30}{13}, \frac{-6}{13}\right)$
 - equation of directrix is $x + 5y = 0$
 - equation of line through origin and focus is $x + 5y = 0$
 - equation of line through origin and parallel to axis is $x - 5y = 0$

Matching Column Type

13. AB is a chord of the parabola $y^2 = 4x$ such that the normals at A and B intersect at the point $C(9, 6)$.

List I		List II	
(p)	Length of AB	(1)	20
(q)	Area of $\triangle ABC$	(2)	$\frac{4}{\sqrt{13}}$
(r)	Distance of origin from the line through AB	(3)	$\sqrt{13}$

(s)	The area bounded by the coordinate axes and the line through AB	(4)	$\frac{4}{3}$
-----	---	-----	---------------

Codes

	(p)	(q)	(r)	(s)
(a)	3	1	2	4
(b)	2	3	4	1
(c)	4	2	1	3
(d)	2	4	3	1

Answers Key**Single Correct Answer Type**

1. (d) 2. (c) 3. (a) 4. (a) 5. (a)
 6. (b) 7. (b)

Multiple Correct Answers Type

8. (a, b, c) 9. (a, c) 10. (a, b) 11. (a, b, c, d)
 12. (a, b, c, d)

Matching Column Type

13. (a)

DPP 6.1

Equation of Ellipse and its Properties

Single Correct Answer Type

- The second-degree equation $x^2 + 4y^2 + 2x + 16y + 13 = 0$ represents
 - a parabola
 - a pair of straight line
 - an ellipse
 - a hyperbola
- In the standard ellipse, the lines joining the ends of the minor axis to one focus are at right angles. The distance between the focus and the nearer vertex is $\sqrt{10} - \sqrt{5}$. The equation of the ellipse
 - $\frac{x^2}{36} + \frac{y^2}{18} = 1$
 - $\frac{x^2}{40} + \frac{y^2}{20} = 1$
 - $\frac{x^2}{20} + \frac{y^2}{10} = 1$
 - $\frac{x^2}{10} + \frac{y^2}{5} = 1$
- The foci of an ellipse are $(-2, 4)$ and $(2, 1)$. The point $\left(1, \frac{23}{6}\right)$ is an extremity of the minor axis. What is the value of the eccentricity?
 - $\frac{9}{13}$
 - $\frac{3}{\sqrt{13}}$
 - $\frac{2}{\sqrt{13}}$
 - $\frac{4}{13}$
- Let $Q = (3, \sqrt{5})$, $R = (7, 3\sqrt{5})$. A point P in the XY -plane varies in such a way that perimeter of ΔPQR is 16. Then the maximum area of ΔPQR is
 - 6
 - 12
 - 18
 - 9
- The eccentricity of the ellipse $(x - 3)^2 + (y - 4)^2 = \frac{y^2}{9}$ is
 - $\frac{\sqrt{3}}{2}$
 - $\frac{1}{3}$
 - $\frac{1}{3\sqrt{2}}$
 - $\frac{1}{\sqrt{3}}$
- Area bounded by the circle which is concentric with the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ and which passes through $\left(4, -\frac{9}{5}\right)$, the vertical chord common to both circle and ellipse on the positive side of x -axis is
 - $\frac{481}{25} \tan^{-1}\left(\frac{9}{20}\right) - \frac{36}{5}$
 - $2 \tan^{-1}\left(\frac{9}{20}\right)$
 - $\frac{481}{25} \tan^{-1}\left(\frac{9}{20}\right)$
 - none of these
- If A and B are foci of ellipse $(x - 2y + 3)^2 + (8x + 4y + 4)^2 = 20$ and P is any point on it, then $PA + PB =$
 - 2
 - 4
 - $\sqrt{2}$
 - $2\sqrt{2}$
- The distance between directrix of the ellipse $(4x - 8)^2 + 16y^2 = (x + \sqrt{3}y + 10)^2$ is
 - 12
 - 16
 - 20
 - 24
- A chord is drawn passing through $P(2, 2)$ on the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ such that it intersects the ellipse at A and B . Then maximum value of $PA \cdot PB$ is
 - $\frac{61}{4}$
 - $\frac{59}{4}$
 - $\frac{71}{4}$
 - $\frac{63}{4}$

10. If (x, y) lies on the ellipse $x^2 + 2y^2 = 2$, then maximum value of $x^2 + y^2 + \sqrt{2}xy - 1$ is
 (a) $\frac{\sqrt{5}+1}{2}$ (b) $\frac{\sqrt{5}-1}{2}$
 (c) $\frac{\sqrt{5}+1}{4}$ (d) $\frac{\sqrt{5}-1}{4}$
11. If the eccentric angles of two points P and Q on the ellipse $\frac{x^2}{28} + \frac{y^2}{7} = 1$ whose center is C , differ by a right angle, then the area of ΔCPQ is
 (a) 5 (b) 6 (c) 7 (d) 8
12. P and Q are points on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ whose centre is C . The eccentric angles of P and Q differ by a right angle. If $\angle PCQ$ is minimum, the eccentric angle of P can be
 (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$
 (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{12}$
13. The eccentric angle of a point P lying in the first quadrant on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is θ . If OP makes an angle ϕ with x -axis, then $\theta - \phi$ will be maximum when $\theta =$
 (a) $\tan^{-1} \sqrt{\frac{a}{b}}$ (b) $\tan^{-1} \sqrt{\frac{b}{a}}$
 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{3}$
14. Let P and Q be points of the ellipse $16x^2 + 25y^2 = 400$ so that $PQ = 96/25$ and P and Q lie above major axis. Circle drawn with PQ as diameter touch major axis at positive focus, then the value of slope m of PQ is
 (a) -1 (b) $1/2$
 (c) 2 (d) $1/3$
15. If the reflection of the ellipse $\frac{(x-4)^2}{16} + \frac{(y-3)^2}{9} = 1$ in the mirror line $x - y - 2 = 0$ is $k_1x^2 + k_2y^2 - 160x - 36y + 292 = 0$, then $\frac{k_1 + k_2}{5}$ is equal to
 (a) 4 (b) 5 (c) 6 (d) 7
16. A point P moves on $x - y$ plane such that $PS + PS' = 4$ where $S(K, 0)$ and $S'(-K, 0)$, then which of the following is not true about the locus of P ?
 (a) ellipse if $K \in (-2, 2)$
 (b) pair of coincidence lines if $K = \pm 2$
 (c) empty if $K \in (-\infty, -2) \cup (2, \infty)$
 (d) none of these
17. The ratio of the area enclosed by the locus of the midpoint of PS and area of the ellipse is (P -be any point on the ellipse and S , its focus)
 (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{5}$ (d) $\frac{1}{4}$
18. Number of integral values of ' α ' for which the point $\left(7 - \frac{5}{4}\alpha, \alpha\right)$ lies inside the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is
 (a) 0 (b) 1 (c) 2 (d) 3
19. Coordinates of the vertices B and C of a triangle ABC are $(2, 0)$ and $(8, 0)$ respectively. The vertex A is varying in such a way that $4 \tan \frac{B}{2} \cdot \tan \frac{C}{2} = 1$. Then locus of A is
 (a) $\frac{(x-5)^2}{25} + \frac{y^2}{16} = 1$ (b) $\frac{(x-5)^2}{16} + \frac{y^2}{25} = 1$
 (c) $\frac{(x-5)^2}{25} + \frac{y^2}{9} = 1$ (d) $\frac{(x-5)^2}{9} + \frac{y^2}{25} = 1$
20. PQ and QR are two focal chords of an ellipse and the eccentric angles of P, Q, R are $2\alpha, 2\beta, 2\gamma$, respectively, then $\tan \beta \tan \gamma$ is equal to
 (a) $\cot \alpha$ (b) $\cot^2 \alpha$
 (c) $2 \cot \alpha$ (d) None of these

Multiple Correct Answers Type

21. In triangle ABC , $a = 4$ and $b = c = 2\sqrt{2}$. A point P moves within the triangle such that the square of its distance from BC is half the area of rectangle contained by its distances from the other two sides. If D be the centre of locus of P , then
 (a) locus of P is an ellipse with eccentricity $\sqrt{\frac{2}{3}}$
 (b) locus of P is a hyperbola with eccentricity $\sqrt{\frac{3}{2}}$
 (c) area of the quadrilateral $ABCD = \frac{16}{3}$ sq. units
 (d) area of the quadrilateral $ABCD = \frac{32}{3}$ sq. units
22. Extremities of the latus rectum of the ellipses $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 (a > b)$ having a major axis $2a$ lies on
 (a) $x^2 = a(a - y)$ (b) $x^2 = a(a + y)$
 (c) $y^2 = a(a + x)$ (d) $y^2 = a(a - x)$
23. Identify correct statement(s) about conic $\sqrt{(x-5)^2 + (y-7)^2} + \sqrt{(x+1)^2 + (y+1)^2} = 12$
 (a) centre of conic is $(2, 3)$
 (b) conic is hyperbola with foci $(5, 7)$ and $(-1, -1)$
 (c) conic is ellipse with major axis $4x - 3y + 1 = 0$
 (d) eccentricity of conic is $\frac{5}{7}$

Answers Key

Single Correct Answer Type

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (c) | 2. (d) | 3. (b) | 4. (b) | 5. (b) |
| 6. (a) | 7. (b) | 8. (b) | 9. (b) | 10. (a) |
| 11. (c) | 12. (b) | 13. (a) | 14. (a) | 15. (b) |
| 16. (d) | 17. (d) | 18. (b) | 19. (a) | 20. (b) |

Multiple Correct Answers Type

21. (a, c) 22. (a, b) 23. (a, c)

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DPP 6.2

Tangent and Normal, Chord of Contact, Mid Point Chord

Single Correct Answer Type

- The value of λ , for which the line $2x - \frac{8}{3}\lambda y = -3$ is a normal to the conic $x^2 + \frac{y^2}{4} = 1$ is
 - $\frac{3}{8}$
 - $\frac{1}{2}$
 - $-\frac{\sqrt{3}}{2}$
 - $\frac{\sqrt{3}}{2}$
- If the length of the major axis intercepted between the tangent and normal at a point $P(a \cos \theta, b \sin \theta)$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is equal to the length of semi-major axis, then eccentricity of the ellipse is
 - $\frac{\cos \theta}{\sqrt{1 - \cos \theta}}$
 - $\frac{\sqrt{1 - \cos \theta}}{\cos \theta}$
 - $\frac{\sqrt{1 - \cos \theta}}{\sin \theta}$
 - $\frac{\sin \theta}{\sqrt{1 - \sin \theta}}$
- How many tangents to the circle $x^2 + y^2 = 3$ are normal to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$?
 - 3
 - 2
 - 1
 - 0
- An ellipse passes through the point $(2, 3)$ and its axes along the coordinate axes. $3x + 2y - 1 = 0$ is a tangent to the ellipse, then the equation of the ellipse is
 - $\frac{x^2}{4} + 4y^2 = 1$
 - $\frac{x^2}{8} + \frac{y^2}{1} = 1$
 - $4x^2 + \frac{y^2}{4} = 1$
 - No such ellipse exists
- If $x \cos \alpha + y \sin \alpha = 4$ is tangent to $\frac{x^2}{25} + \frac{y^2}{9} = 1$, then the value of α is
 - $\tan^{-1}(3/\sqrt{7})$
 - $\tan^{-1}(7/3)$
 - $\tan^{-1}(\sqrt{3}/7)$
 - $\tan^{-1}(3/7)$
- If the normal at any point P of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ meets the coordinate axes at M and N respectively, then $|PM| : |PN|$ equals
 - 4 : 3
 - 16 : 9
 - 9 : 16
 - 3 : 4
- If the normal at any point P on the ellipse cuts the major and minor axes in G and g respectively and C be the centre of the ellipse, then
 - $a^2(CG)^2 + b^2(Cg)^2 = (a^2 - b^2)^2$
 - $a^2(CG)^2 - b^2(Cg)^2 = (a^2 - b^2)^2$
 - $a^2(CG)^2 - b^2(Cg)^2 = (a^2 + b^2)^2$
 - None of these
- The area of the parallelogram formed by the tangents at the points whose eccentric angles are $\theta, \theta + \frac{\pi}{2}, \theta + \pi, \theta + \frac{3\pi}{2}$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is
 - ab
 - $4ab$
 - $3ab$
 - $2ab$
- The straight line $\frac{x}{4} + \frac{y}{3} = 1$ intersects the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ at two points A and B , there is a point P on this ellipse such that the area of $\triangle PAB$ is equal to $6(\sqrt{2} - 1)$. Then the number of such points (P) is/are
 - 0
 - 1
 - 2
 - 3
- The tangent at any point on the ellipse $16x^2 + 25y^2 = 400$ meets the tangents at the ends of the major axis at T_1 and T_2 . The circle on T_1T_2 as diameter passes through
 - $(3, 0)$
 - $(0, 0)$
 - $(0, 3)$
 - $(4, 0)$
- The minimum value of $\{(r + 5 - 4|\cos \theta|)^2 + (r - 3|\sin \theta|)^2\} \forall r, \theta \in \mathbb{R}$ is
 - 0
 - 2
 - 3
 - None of these
- Let S_1 and S_2 denote the circles $x^2 + y^2 + 10x - 24y - 87 = 0$ and $x^2 + y^2 - 10x - 24y + 153 = 0$ respectively. The value of a for which the line $y = ax$ contains the centre of a circle which touches S_2 externally and S_1 internally is
 - $\pm \frac{3}{10}$
 - $\pm \frac{1}{5}$
 - $\pm \frac{\sqrt{13}}{10}$
 - $\pm \frac{10}{13}$

13. If ω is one of the angles between the normals to the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \text{ at the points whose eccentric angles are } \theta$$

and $\frac{\pi}{2} + \theta$, then $\frac{2 \cot \omega}{\sin 2\theta}$ is

- (a) $\frac{e^2}{\sqrt{1-e^2}}$ (b) $\frac{e^2}{\sqrt{1+e^2}}$
(c) $\frac{e^2}{1-e^2}$ (d) $\frac{e^2}{1+e^2}$

14. From any point on the line $(t+2)(x+y) = 1, t \neq -2$, tangents are drawn to the ellipse $4x^2 + 16y^2 = 1$. It is given that chord of contact passes through a fixed point. Then the number of integral values of ' t ' for which the fixed point always lies inside the ellipse is

- (a) 0 (b) 1 (c) 2 (d) 3

15. At a point P on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ tangent PQ is drawn. If the point Q be at a distance $\frac{1}{p}$ from the point P , where ' p ' is distance of the tangent from the origin, then the locus of the point Q is

- (a) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 + \frac{1}{a^2 b^2}$ (b) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 - \frac{1}{a^2 b^2}$
(c) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{a^2 b^2}$ (d) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{1}{a^2 b^2}$

16. From a point P perpendicular tangents PQ and PR are drawn to ellipse $x^2 + 4y^2 = 4$, then locus of circumcentre of triangle PQR is

- (a) $x^2 + y^2 = \frac{16}{5}(x^2 + 4y^2)^2$
(b) $x^2 + y^2 = \frac{5}{16}(x^2 + 4y^2)^2$
(c) $x^2 + 4y^2 = \frac{16}{5}(x^2 + y^2)^2$
(d) $x^2 + 4y^2 = \frac{16}{5}(x^2 + y^2)^2$

17. If the normal at any point P on ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ meets the auxiliary circle at Q and R such that $\angle QOR = 90^\circ$ where O is centre of ellipse, then

- (a) $a^4 + 2b^4 \geq 3a^2 b^2$
(b) $a^4 + 2b^4 \geq 5a^2 b^2 + 2a^3 b$
(c) $a^4 + 2b^4 \geq 3a^2 b^2 + ab$
(d) None of these

Multiple Correct Answers Type

18. P and Q are two points on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ whose eccentric angles differ by 90° , then

- (a) Locus of point of intersection of tangents at P and Q is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$
(b) Locus of mid-point (P, Q) is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{2}$
(c) Product of slopes of OP and OQ where O is the centre is $-\frac{b^2}{a^2}$
(d) Max. area of $\triangle OPQ$ is $\frac{1}{2}ab$

19. For the ellipses $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$

- (a) The foci of each ellipse always lie within the other ellipse
(b) Their auxiliary circles are the same
(c) Their director circles are the same
(d) The ellipses enclose the same area

20. AB and CD are two equal and parallel chords of the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1. \text{ Tangents to the ellipse at } A \text{ and } B \text{ intersect}$$

- at P and tangents at C and D at Q . The line PQ
(a) passes through the origin
(b) is bisected at the origin
(c) cannot pass through the origin
(d) is not bisected at the origin

Answers Key

Single Correct Answer Type

1. (d) 2. (b) 3. (d) 4. (d) 5. (a)
6. (c) 7. (a) 8. (b) 9. (d) 10. (a)

11. (a) 12. (c) 13. (a) 14. (c) 15. (a)
16. (b) 17. (b)

Multiple Correct Answers Type

18. (a, b, c, d) 19. (b, c, d) 20. (a, b)

DPP 6.3

Properties of Tangent and Normal

Single Correct Answer Type

- Tangents are drawn from any point on the circle $x^2 + y^2 = 41$ to the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ then the angle between the two tangents is
 (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$
- If radius of the director circle of the ellipse $\frac{(3x+4y-2)^2}{100} + \frac{(4x-3y+5)^2}{625} = 1$ is
 (a) 6 (b) $\sqrt{34}$ (c) $\sqrt{29}$ (d) $\sqrt{26}$
- If the curve $x^2 + 3y^2 = 9$ subtends an obtuse angle at the point $(2\alpha, \alpha)$, then a possible value of α^2 is
 (a) 1 (b) 2 (c) 3 (d) 4
- An ellipse has the point $(1, -1)$ and $(2, -1)$ as its foci and $x + y = 5$ as one of its tangent then value of $a^2 + b^2$ where a, b are the length of semi-major and semi-minor axis of ellipse respectively, is
 (a) $\frac{41}{2}$ (b) 10 (c) 19 (d) $\frac{81}{4}$
- An ellipse has foci at $(9, 20)$ and $(49, 55)$ in the xy -plane and is tangent to the x axis. The length of its major axis is
 (a) 85 (b) 75 (c) 65 (d) 55
- The maximum distance of the centre of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ from the chord of contact of mutually perpendicular tangents of the ellipse is
 (a) $\frac{144}{5}$ (b) $\frac{9}{5}$ (c) $\frac{16}{5}$ (d) $\frac{8}{5}$
- P_1 and P_2 are the lengths of the perpendicular from the foci on the tangent to the ellipse and P_3 and P_4 are perpendiculars from extremities of major axis and P from the centre of the ellipse on the same tangent, then $\frac{P_1 P_2 - P^2}{P_3 P_4 - P^2}$ equals (where e is the eccentricity of the ellipse)
 (a) e (b) $\sqrt{e}$
 (c) e^2 (d) none of these
- From the focus $(-5, 0)$ of the ellipse $\frac{x^2}{45} + \frac{y^2}{20} = 1$, a ray of light is sent which makes angle $\cos^{-1}\left(\frac{-1}{\sqrt{5}}\right)$ with the positive direction of X -axis upon reacting the ellipse the ray is reflected from it. Slope of the reflected ray is
 (a) $-\frac{3}{2}$ (b) $-\frac{7}{3}$ (c) $-\frac{5}{4}$ (d) $-\frac{2}{11}$
- Let $5x - 3y = 8\sqrt{2}$ be normal at $P\left(\frac{5}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$ to an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$. If M, M' are feet of perpendiculars from foci S, S' respectively on tangent at P , then point of intersection of SM' and $S'M$ is
 (a) $\left(\frac{5}{2}, 0\right)$ (b) $\left(0, \frac{5}{2}\right)$
 (c) $\left(\frac{41}{10\sqrt{2}}, \frac{3}{2\sqrt{2}}\right)$ (d) $\left(\frac{3}{2\sqrt{2}}, \frac{41}{10\sqrt{2}}\right)$
- If the normals at α, β, γ , and δ on an ellipse are concurrent, then the value of $(\sum \cos \alpha)(\sum \sec \alpha)$ is
 (a) 2 (b) 4
 (c) 6 (d) none of these
- The locus of chords of contact of perpendicular tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ touch another fixed ellipse is
 (a) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{(2a^2 + b^2)}$
 (b) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{2}{(a^2 - b^2)}$
 (c) $\frac{x^2}{a^4} + \frac{y^2}{b^4} = \frac{1}{(a^2 + b^2)}$
 (d) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{2}{(3a^2 - b^2)}$
- Match the following lists
 Consider an ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ with centre C and point P on it with eccentric angle $\pi/4$. Normal drawn at P intersects

the major and minor axes in A and B respectively N_1 and N_2 are the feet of the perpendiculars from the foci S_1 and S_2 respectively on the tangent at P and N is the foot of the perpendicular from the centre of the ellipse on the normal at P . tangent at ' P ' intersect the axis of x at T .

Match the List I with the List II using the above information.

List I

(P) $(CA)(CT)$ is equal to

(Q) $(PN)(PB)$ is equal to

(R) $(S_1N_1)(S_2N_2)$ is equal to

(S) $(S_1P)(S_2P)$ is equal to

List II

(1) 9 (2) 16 (3) 17 (4) 25

Codes

	P	Q	R	S
(a)	2	3	4	1
(b)	3	1	4	2
(c)	2	4	1	3
(d)	4	1	2	3

Answers Key

Single Correct Answer Type

1. (d) 2. (c) 3. (b) 4. (d) 5. (a)

6. (c)
11. (c)

7. (c)
12. (c)

8. (d)

9. (c)

10. (b)

DPP 7.1

Equation of Hyperbola and its Properties

Single Correct Answer Type

1. The locus of
- $P(x, y)$
- such that

$$\sqrt{x^2 + y^2 + 8y + 16} - \sqrt{x^2 + y^2 - 6x + 9} = 5, \text{ is}$$

- (a) hyperbola (b) circle
(c) finite line segment (d) infinite ray

2. The distance of the focus of
- $x^2 - y^2 = 4$
- , from the directrix, which is nearer to it, is

- (a) $2\sqrt{2}$ (b) $\sqrt{2}$ (c) $4\sqrt{2}$ (d) $8\sqrt{2}$

3. If
- $\frac{x^2}{36} - \frac{y^2}{k^2} = 1$
- is a hyperbola, then which of the following points lie on hyperbola?

- (a) (3, 1) (b) (-3, 1)
(c) (5, 2) (d) (10, 4)

4. The ellipse
- $\frac{x^2}{25} + \frac{y^2}{16} = 1$
- and the hyperbola
- $\frac{x^2}{25} - \frac{y^2}{16} = 1$
- have in common

- (a) centre and vertices only
(b) centre, foci and vertices
(c) centre, foci and directrices
(d) centre only

5. The equation to the hyperbola having its eccentricity 2 and the distance between its foci is 8 is

- (a) $\frac{x^2}{12} - \frac{y^2}{4} = 1$ (b) $\frac{x^2}{4} - \frac{y^2}{12} = 1$
(c) $\frac{x^2}{8} - \frac{y^2}{2} = 1$ (d) $\frac{x^2}{16} - \frac{y^2}{9} = 1$

6. If the centre, vertex and focus of a hyperbola be (0, 0), (4, 0) and (6, 0) respectively, then the equation of the hyperbola is

- (a) $4x^2 - 5y^2 = 8$ (b) $4x^2 - 5y^2 = 80$
(c) $5x^2 - 4y^2 = 80$ (d) $5x^2 - 4y^2 = 8$

7. The equation
- $\frac{x^2}{9-\lambda} + \frac{y^2}{4-\lambda} = 1$
- represents a hyperbola

when $a < \lambda < b$ then $(b-a) =$

- (a) 3 (b) 4
(c) 5 (d) 6

8. If
- e
- and
- e'
- are the eccentricities of the hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \text{ and } \frac{y^2}{b^2} - \frac{x^2}{a^2} = 1, \text{ then the point } \left(\frac{1}{e}, \frac{1}{e'}\right)$$

lies on the circle:

- (a) $x^2 + y^2 = 1$ (b) $x^2 + y^2 = 2$
(c) $x^2 + y^2 = 3$ (d) $x^2 + y^2 = 4$

9. If
- P
- is any point common to the hyperbola
- $\frac{x^2}{16} - \frac{y^2}{25} = 1$
- and

the circle having line segment joining its foci as diameter then sum of focal distances of point P is

- (a) $6\sqrt{2}$ (b) $2\sqrt{66}$
(c) 16 (d) 8

10. The length of the transverse axis of the hyperbola
- $9x^2 - 16y^2 - 18x - 32y - 151 = 0$
- is

- (a) 8 (b) 2
(c) 6 (d) 2

7.2 Coordinate Geometry

11. A hyperbola has centre 'C' and one focus at $P(6, 8)$. If its two directrices are $3x + 4y + 10 = 0$ and $3x + 4y - 10 = 0$ then $CP =$
 (a) 14 (b) 8 (c) 10 (d) 6
12. If the foci of $\frac{x^2}{16} + \frac{y^2}{4} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{3} = 1$ coincide, the value of a is
 (a) 3 (b) 2 (c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{3}$
13. A rectangular hyperbola of latus rectum 4 units passes through $(0, 0)$ and has $(2, 0)$ as its one focus. The equation of locus of the other focus is
 (a) $x^2 + y^2 = 36$ (b) $x^2 + y^2 = 4$
 (c) $x^2 - y^2 = 4$ (d) $x^2 + y^2 = 9$
14. If the curves $x^2 - y^2 = 4$ and $xy = \sqrt{5}$ intersect at points A and B, then the possible number of point(s) C on the curve $x^2 - y^2 = 4$ such that triangle ABC is equilateral is
 (a) 0 (b) 1 (c) 2 (d) 4
15. The point $(3 \tan(\theta + 60^\circ), 2 \tan(\theta + 30^\circ))$ lies on the conic, then its centre is (θ is the parameter)
 (a) $(-3\sqrt{3}, 2\sqrt{3})$ (b) $(3\sqrt{3}, -2\sqrt{3})$
 (c) $(-3\sqrt{3}, -2\sqrt{3})$ (d) $(0, 0)$
- (a) $2\alpha = a(2e + E)$ (b) $a - e\alpha = E\alpha - a/2$
 (c) $E = \frac{\sqrt{e^2 + 24} - 3e}{2}$ (d) $E = \frac{\sqrt{e^2 + 12} - 3e}{2}$
17. A hyperbola having the transverse axis of length $\frac{1}{2}$ unit is confocal with the ellipse $3x^2 + 4y^2 = 12$, then
 (a) Equation of the hyperbola is $\frac{x^2}{15} - \frac{y^2}{1} = \frac{1}{16}$
 (b) Eccentricity of the hyperbola is 4
 (c) Distance between the directrices of the hyperbola is $\frac{1}{8}$ units
 (d) Length of latus rectum of the hyperbola is $\frac{15}{2}$ units
18. In X-Y plane, the path defined by the equation $\frac{1}{x^m} + \frac{1}{y^n} + \frac{k}{(x+y)^n} = 0$, is
 (a) a parabola if $m = \frac{1}{2}, k = -1, n = 0$
 (b) a hyperbola if $m = 1, k = -1, n = 0$
 (c) a pair of lines if $m = k = n = 1$
 (d) a pair of lines if $m = k = -1, n = 1$
19. A point moves such that the sum of the squares of its distances from the two sides of length 'a' of a rectangle is twice the sum of the squares of its distances from the other two sides of length 'b'. The locus of the point can be
 (a) a circle (b) an ellipse
 (c) a hyperbola (d) a pair of lines
20. The equation of a hyperbola with co-ordinate axes as principal axes, and the distances of one of its vertices from the foci are 3 and 1 can be
 (a) $3x^2 - y^2 = 3$ (b) $x^2 - 3y^2 + 3 = 0$
 (c) $x^2 - 3y^2 - 3 = 0$ (d) none of these

Multiple Correct Answers Type

16. If $P(a, b)$, the point of intersection of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{a^2(1-e^2)} = 1$ and the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{a^2(E^2-1)} = \frac{1}{4}$ is equidistant from the foci of the two curves (all lying in the right of y-axis), then

Answers Key

Single Correct Answer Type

1. (d) 2. (b) 3. (d) 4. (a) 5. (b)
 6. (c) 7. (c) 8. (a) 9. (b) 10. (a)
 11. (c) 12. (a) 13. (a) 14. (a) 15. (a)

Multiple Correct Answers Type

16. (b, c) 17. (b, c, d) 18. (a, b, c, d)
 19. (c, d) 20. (a, b)

DPP 7.2

Tangent and Normal, Chord of Contact, Mid Point Chord

Single Correct Answer Type

- The equation of a tangent to the hyperbola $3x^2 - y^2 = 3$, parallel to the line $y = 2x + 4$ is
 (a) $y = 2x + 3$ (b) $y = 2x + 1$
 (c) $y = 2x + 4$ (d) $y = 2x + 2$
- A tangent to the hyperbola $y = \frac{x+9}{x+5}$ passing through the origin is
 (a) $x + 25y = 0$ (b) $5x + y = 0$
 (c) $5x - y = 0$ (d) $x - 25y = 0$
- The absolute value of slope of common tangents to parabola $y^2 = 8x$ and hyperbola $3x^2 - y^2 = 3$ is
 (a) 1 (b) 2 (c) 3 (d) 4
- For the hyperbola $xy = 8$ any tangent of it at P meets co-ordinates at Q and R then area of triangle CQR where 'C' is centre of the hyperbola is
 (a) 16 sq. units (b) 12 sq. units
 (c) 24 sq. units (d) 18 sq. units
- The tangents and normal at a point on $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ cut the y-axis A and B . Then the circle on AB as diameter passes through
 (a) one of the vertex of the hyperbola
 (b) one of the foot of directrix on x-axis of the hyperbola
 (c) foci of the hyperbola
 (d) none of these
- If $4x^2 + py^2 = 45$ and $x^2 - 4y^2 = 5$ cut orthogonally, then the value of p is
 (a) $1/9$ (b) $1/3$
 (c) 3 (d) 9
- A tangent drawn to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at $P\left(\frac{\pi}{6}\right)$ forms a triangle of area $3a^2$ square units, with coordinate axes, then the square of its eccentricity is equal to
 (a) 15 (b) 16 (c) 17 (d) 18
- If m is the slope of a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ where $a > b > 1$ then
 (a) $(a+b)m^2 + ab \geq (a+b)^2$
 (b) $(a+b)^2m + ab \geq (a+b)$
 (c) $abm^2 + (a+b) \geq (a+b)^2$
 (d) $(a+b)m^2 + a^2b^2 \geq (a+b)^2$
- Two tangents to the hyperbola $\frac{x^2}{25} - \frac{y^2}{9} = 1$, having slopes 2 and m where $(m \neq 2)$ cuts the axes at four concyclic points then the slope m is/are
 (a) $-\frac{1}{2}$ (b) -2 (c) $\frac{1}{2}$ (d) 2
- The equation of that chord of hyperbola $25x^2 - 16y = 400$, whose mid point is $(5, 3)$ is
 (a) $115x - 117y = 17$ (b) $125x - 48y = 481$
 (c) $127x + 33y = 341$ (d) $15x - 121y = 105$
- If a chord joining $P(a \sec \theta, a \tan \theta)$, $Q(a \sec \alpha, a \tan \alpha)$ on the hyperbola $x^2 - y^2 = a^2$ is the normal at P , then $\tan \alpha =$
 (a) $\tan \theta (4 \sec^2 \theta + 1)$ (b) $\tan \theta (4 \sec^2 \theta - 1)$
 (c) $\tan \theta (2 \sec^2 \theta - 1)$ (d) $\tan \theta (1 - 2 \sec^2 \theta)$
- The number of normal(s) of a rectangular hyperbola which can touch its conjugate is equal to
 (a) 0 (b) 2 (c) 4 (d) 8
- If the normal at a point P to the hyperbola meets the transverse axis at G , and the value of SG/SP is 6, then the eccentricity of the hyperbola is (where S is focus of the hyperbola).
 (a) 2 (b) 4 (c) 6 (d) 8
- If the normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at any point $P(a \sec \theta, b \tan \theta)$ meets the transverse and conjugate axes in G and g respectively and if 'f' is the foot of perpendicular to the normal at P from the centre 'C', then minimum of PG is
 (a) $\frac{b^2}{a}$ (b) $\left| \frac{a}{b}(a+b) \right|$
 (c) $\left| \frac{b}{a}(a-b) \right|$ (d) $\left| \frac{a}{b}(a-b) \right|$
- If normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ drawn at an extremity of its latus rectum has slope equal to slope of line which meets hyperbola only once then the eccentricity of hyperbola is
 (a) $e = \sqrt{\frac{1+\sqrt{5}}{2}}$ (b) $e = \sqrt{\frac{\sqrt{5}+3}{2}}$
 (c) $e = \sqrt{\frac{2}{\sqrt{5}-1}}$ (d) None of these

7.4 Coordinate Geometry

16. At the point of intersection of the rectangular hyperbola $xy = c^2$ and the parabola $y^2 = 4ax$ tangents to the rectangular hyperbola and the parabola make an angle θ and ϕ respectively with x -axis, then

(a) $\theta = \tan^{-1}(-2 \tan \phi)$ (b) $\theta = \frac{1}{2} \tan^{-1}(-\tan \phi)$
 (c) $\phi = \tan^{-1}(-2 \tan \theta)$ (d) $\phi = \frac{1}{2} \tan^{-1}(-\tan \theta)$

Multiple Correct Answers Type

17. Three points A, B and C are taken on rectangular hyperbola $xy = 4$ where $B(-2, -2)$ and $C(6, 2/3)$. The normal at A is parallel to BC , then
 (a) circumcentre of $\triangle ABC$ is $(2, -2/3)$

(b) equation of circumcircle of $\triangle ABC$ is $3x^2 + 3y^2 - 12x + 4y - 40 = 0$

(c) orthocenter of $\triangle ABC$ is $\left(\frac{2}{\sqrt{3}}, 2\sqrt{3}\right)$

(d) none of these

18. A tangent is drawn at any point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. If this tangent is intersected by the tangents at the vertices at points P and Q , then which of the following is/are true

- (a) S, S', P and Q are concyclic
 (b) PQ is diameter of the circle
 (c) S, S', P and Q forms rhombus
 (d) PQ is diagonal of acute angle of the rhombus formed by S, S', P and Q

Answers Key

Single Correct Answer Type

1. (b) 2. (a) 3. (b) 4. (a) 5. (c)
 6. (d) 7. (c) 8. (a) 9. (c) 10. (b)
 11. (b) 12. (c) 13. (c) 14. (a) 15. (a)
 16. (a)

Multiple Correct Answers Type

17. (a, b, c) 18. (a, b)

DPP 7.3

Asymptotes, Properties of Tangent and Normal, Locus

Single Correct Answer Type

- The number of points from where a pair of perpendicular tangents can be drawn to the hyperbola, $x^2 \sec^2 \alpha - y^2 \operatorname{cosec}^2 \alpha = 1$, $\alpha \in (0, \pi/4)$, is
(a) 0 (b) 1 (c) 2 (d) infinite
- If e is the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and θ is the angle between the asymptotes, then $\cos \frac{\theta}{2}$ is equal to
(a) $\frac{1-e}{e}$ (b) $\frac{2}{e} - e$
(c) $\frac{1}{e}$ (d) $\frac{2}{e}$
- The equation of a hyperbola whose asymptotes are $3x \pm 5y = 0$ and vertices are $(\pm 5, 0)$ is
(a) $9x^2 - 25y^2 = 225$ (b) $25x^2 - 9y^2 = 225$
(c) $5x^2 - 3y^2 = 225$ (d) $3x^2 - 5y^2 = 25$
- The tangent at P on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ meets one of the asymptote in Q . Then the locus of the mid-point of PQ is
(a) $3\left(\frac{x^2}{a^2} - \frac{y^2}{b^2}\right) = 4$ (b) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2$
(c) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{1}{2}$ (d) $4\left(\frac{x^2}{a^2} - \frac{y^2}{b^2}\right) = 3$
- Locus of perpendicular from center upon normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is
(a) $(x^2 + y^2)^2 \left(\frac{a^2}{x^2} + \frac{b^2}{y^2} \right) = (a^2 - b^2)^2$
(b) $(x^2 + y^2)^2 \left(\frac{a^2}{x^2} - \frac{b^2}{y^2} \right) = (a^2 + b^2)^2$
(c) $(x^2 + y^2)^2 \left(\frac{x^2}{a^2} - \frac{y^2}{b^2} \right) = (a^2 + b^2)^2$
(d) None of these

- Let the transverse axis of a varying hyperbola be fixed with length of transverse axis being $2a$. Then the locus of the point of contact of any tangent drawn to it from a fixed point on conjugate axis is
(a) a parabola (b) a circle
(c) an ellipse (d) a hyperbola
- The locus of the foot of the perpendicular from the centre of the hyperbola $xy = c^2$ on a variable tangent is
(a) $(x^2 - y^2)^2 = 4c^2xy$ (b) $(x^2 + y^2)^2 = 2c^2xy$
(c) $(x^2 - y^2)^2 = 2c^2xy$ (d) $(x^2 + y^2)^2 = 4c^2xy$

Multiple Correct Answers Type

- If two tangents can be drawn the different branches of hyperbola $\frac{x^2}{1} - \frac{y^2}{4} = 1$ from (α, α^2) , then
(a) $\alpha \in (-2, 0)$ (b) $\alpha \in (0, 2)$
(c) $\alpha \in (-\infty, -2)$ (d) $\alpha \in (2, \infty)$
- The director circle of a hyperbola is $x^2 + y^2 - 4y = 0$. One end of the major axis is $(2, 0)$ then a focus is
(a) $(\sqrt{3}, 2 - \sqrt{3})$ (b) $(-\sqrt{3}, 2 + \sqrt{3})$
(c) $(\sqrt{6}, 2 - \sqrt{6})$ (d) $(-\sqrt{6}, 2 + \sqrt{6})$
- The points on the ellipse $\frac{x^2}{2} + \frac{y^2}{10} = 1$ from which perpendicular tangents can be drawn to the hyperbola $\frac{x^2}{5} - \frac{y^2}{1} = 1$ is/are
(a) $\left(\sqrt{\frac{3}{2}}, \sqrt{\frac{5}{2}}\right)$ (b) $\left(\sqrt{\frac{3}{2}}, -\sqrt{\frac{5}{2}}\right)$
(c) $\left(-\sqrt{\frac{3}{2}}, \sqrt{\frac{5}{2}}\right)$ (d) $\left(\sqrt{\frac{5}{2}}, \sqrt{\frac{3}{2}}\right)$

Comprehension Type

For Q. 11 to 13

Consider a hyperbola $xy = 4$ and a line $y + 2x = 4$. O is the centre of hyperbola. Tangent at any point P of hyperbola intersect the coordinate axes at A and B

11. Locus of circumcentre of triangle OAB is

- (a) an ellipse with eccentricity $\frac{1}{\sqrt{2}}$
- (b) an ellipse with eccentricity $\frac{1}{\sqrt{3}}$
- (c) a hyperbola with eccentricity $\sqrt{2}$
- (d) a circle

12. Shortest distance between the line and hyperbola is

- (a) $\frac{8\sqrt{2}}{\sqrt{5}}$
- (b) $\frac{4(\sqrt{2}-1)}{\sqrt{5}}$
- (c) $\frac{2\sqrt{2}}{\sqrt{5}}$
- (d) $\frac{4(\sqrt{2}+1)}{\sqrt{5}}$

13. Let the given line intersects the x -axis at R . If a line through R , intersect the hyperbolas at S and T , then minimum value of $RS \times RT$ is

- (a) 2
- (b) 4
- (c) 6
- (d) 8

For Q. 14 and 15

Consider a hyperbola: $\frac{(x-7)^2}{a^2} - \frac{(y+3)^2}{b^2} = 1$. The li

$3x - 2y - 25 = 0$, which is not a tangent, intersect the hyperbola

at $H\left(\frac{11}{3}, -7\right)$ only. A variable point $P(\alpha + 7, \alpha^2 - 4) \forall \alpha \in \mathbb{R}$

exists in the plane of the given hyperbola.

14. The eccentricity of the hyperbola is

- (a) $\sqrt{\frac{7}{5}}$
- (b) $\sqrt{2}$
- (c) $\frac{\sqrt{13}}{2}$
- (d) $\frac{3}{2}$

15. Which of the following are not the values of α for which two tangents can be drawn one to each branch of the given hyperbola is

- (a) $(2, \infty)$
- (b) $(-\infty, -2)$
- (c) $\left(-\frac{1}{2}, \frac{1}{2}\right)$
- (d) None of these

Answers Key

Single Correct Answer Type

- 1. (d)
- 2. (c)
- 3. (a)
- 4. (d)
- 5. (b)
- 6. (a)
- 7. (d)

Multiple Correct Answers Type

- 8. (c, d)
- 9. (c, d)
- 10. (a, b, c)

Comprehension Type

- 11. (c)
- 12. (b)
- 13. (d)
- 14. (c)
- 15. (d)